

## **Issue: Flint Drinking Water Issues**

**Background/Status:** Flint has been having issues since changing the source of their drinking water -- from purchasing finished water from Detroit (which comes from Lake Huron) to treating Flint River water themselves at the end of April 2014. The quality of the water in the Flint River is different than that from Lake Huron, and requires additional treatment to ensure an acceptable quality drinking water. The Michigan Department of Environmental Quality (MDEQ) has been working closely with the Operator-in-Charge at Flint's Water Treatment plant to ensure that the citizens of Flint are provided drinking water that meets health standards. The use of Flint River water is an interim decision as Flint plans to connect to the Karegnondi pipeline, which will draw water from Lake Huron, in 2016.

Flint exceeded the health standard for *E. coli* in August 2014 and total coliform in September 2014 due to issues with malfunctioning valves in the distribution system creating stagnated water flow in certain areas. Additional chlorine was added to deal with the bacteria problem and these two violations have returned to compliance. However, the additional chlorine has likely contributed to a Disinfection Byproduct violation -- Total Trihalomethane (TTHM) - in the fourth quarter of 2014. Compliance with the TTHM health standard is based upon the average of one year of quarterly sample data. The initial monitoring in summer 2014 reported elevated levels of TTHM compounds throughout the City's distribution system. MDEQ staff has worked with Flint to implement operational techniques to reduce TTHM levels. Current levels are below the MCL but consumers will continue to receive public notice of a violation until the running annual average gets below the MCL.

In addition to the MCL violations, there have been other potential issues that have been attributed to the water including, complaints about rashes when using the water to bathe, one home has very high lead in the drinking water (RS is working with Flint and the homeowner; not sure if this is system-wide issue), and the Genesee County Health Department is looking into an increase in the number of reported cases of Legionaire's Disease in the county in 2014 (still in the investigative stage by the Health Dept -- not public knowledge yet). Flint has hired a consultant to help with their drinking water utility. Also, a technical advisory committee has been formed, including Dr. Michael Wright, an EPA-ORD toxicologist, who is providing assistance on health effects.

Congressman Kildee requested clarification to whether the Drinking Water State Revolving Fund (DWSRF) allowed forgiveness of principal and if Flint would be eligible to receive it for older loans (\$22M in loans from 1999, 2000, 2001, 2003). While forgiveness of principal is part of the DWSRF program, Flint would not be eligible to receive it on the older loans. This is the same response provided to Flint by the MDEQ SRF program. Flint may qualify for forgiveness of principal for new loans depending on the state criteria for allocating it.

### **Message:**

- Flint switched from purchasing treated Lake Huron water from Detroit to treating Flint River water themselves until a pipeline being constructed can provide them with raw Lake Huron water to treat in 2016.
- Flint has/had MCL violations and has been working with MDEQ staff, a consultant, and a technical advisory committee to improve operations.
- Flint is not eligible for principal forgiveness on their existing loans.

**Contact:** Tom Poy, Water Division, (312) 886-5991, [poy.thomas@epa.gov](mailto:poy.thomas@epa.gov)



## **Busch, Stephen (DEQ)**

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**Subject:** ODWMA Response - Flint KWA-DWSD  
**Attachments:** deq-wb-dwehs-wwwciu-gcdclqwwpermitresponsepubliccomment\_290345\_7.pdf; Rowe Review of Tucker Young Report.pdf

Director Wyant, and Deputy Director Sygo,

Addendums to comments provided yesterday can be found below in red. Additional comments are as follows:

With regards to regulatory authority for DEQ to allow or prevent the breakup of water utilities, and State vs. local decisions about cost effectiveness, it is important to note that when the DEQ permitted the water withdrawal for KWA (permit 2009-001) part of the decision making process (copy attached) included reasonable use and the balance of Economic Development, Social Development, and Environmental Protection. As part of the public participation process general comments were received (pages 6 & 7) regarding impacts on DWSD and rates to remaining customers. The Department's response to those comments stated:

"The DEQ is specifically precluded from using part 327 to "...diminish or create any existing authority of municipalities to require persons to connect to municipal water supply systems as authorized by law" (MCL 324.32726)."

And

"It is appropriately an issue for water service contract negotiations between the regional water system and its customers. To do otherwise invites unwanted intervention of the state into local decision making."

Therefore, ODWMA cannot on its own assess an actual dollar value to any regional benefit for the City of Flint to remain a full customer of DWSD. The cost estimates provided in the TYJT report show a cost difference between full KWA and full DWSD participation of \$172 million over 30 years. In addition the formation of KWA would itself be considered one of the largest regional drinking water authorities in the State, and as such any regional benefits provided by DWSD may only be marginal in comparison.

Finally, we have additional questions for TYJT regarding the various DWSD supply options and the considerations they made in the operations of the Flint WTP.

We look forward to further discussion of these comments during our meetings tomorrow, and please let us know if you have any additional questions for us between now and then.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

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**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 3:58 PM  
**To:** Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)  
**Cc:** Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** RE: Flint Draft Response

I will provide additional follow up by tomorrow (Wed.) afternoon to my previous email below based on our discussion and the conference call with Andy Dillon earlier today.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 12:37 PM  
**To:** Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)  
**Cc:** Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.
2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
  - a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, without the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).
  - b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).
3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.
4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
  - a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)
  - b. Pose an increased risk of disinfection by-product (carcinogen) exposure to public health (Flint River vs. Lake Huron source water)
  - c. Trigger additional regulatory requirements under the Michigan Safe Drinking Water Act (LT2ESWTR)
  - d. Require significant enhancements to treatment at the Flint WTP, beyond those identified in the TYJT report (see item 5 below).
  - e. Water Resource Division is evaluating potential impacts to NPDES wastewater discharge permits in downstream segments of the Flint River, as a result of decreased river baseflow caused by Flint WTP use.

5. The TYJT report does not adequately address increased requirements and costs associated with using the Flint River as a significant source for the Flint WTP, which are not necessary under a Lake Huron source water scenario. This includes:
  - a. The need to provide softening treatment
  - b. Limitations on disposal options for lime softening sludge
  - c. Increased ozone capacity, UV disinfection
  - d. Additional backup power, more power required for Flint River operation
6. The Flint WTP must operate at some minimum level and within a range of flow rates to maintain treatment effectiveness. Currently that minimum level is 9 MGD. This level may be reduced with additional capital costs to modify the WTP, not addressed in the TYJT report.
7. Allowing Flint WTP to blend water with DWSD sets a new precedent that could pose future consequences with other DWSD customers.
8. Costs impacts to remaining DWSD customers would be similar under the proposed scenarios, only retaining 8 MGD of 30+ MGD total Flint/Genesee Co. demands, based on the following:
  - a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
  - b. Flint's need to utilize the Flint River as a source
9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits. The KWA water withdrawal permit (2009-001) includes the required implementation of conservation measures that would also drive these distribution system improvements.
10. Major cost discrepancies in TYJT analysis
  - a. Engineering, Legal, Administration, Contingency – TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
  - b. Pumping facilities – TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.
11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA, if they remain with DWSD. However, indications to ODWMA are that these communities are currently in final negotiations with KWA for service, which would make this a non-issue.
  - a. City Lapeer
  - b. City of Imlay City

Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz. (Copy Attached)

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

### City of Flint Water Supply Assessment (TYJT; for Treasury)

DEQ-Drinking Water engineers are responsible for this review. WRD offers one comment however. The KWA pump stations are not supplied with a secondary power source. It would appear that we should ask if this meets "10 States" for drinking water facilities. If power is lost to the pump stations, the Flint WTP would have to be used to supply finished water (with Flint River as the raw source, apparently). It would seem that independent secondary power sources should be provided to the KWA pumping stations to more reliably ensure Lake Huron as the source water.

### Potential Financial Impacts on the DWSD (Sewerage Fund):

It is difficult to quantify the potential financial impact of lost drinking water customers in Flint on the Sewerage Fund. Flint is supplied currently with DWSD drinking water but provides their own wastewater treatment. However, the following is offered:

- Some common functions in DWSD serve both Water and Sewerage. These include HR, purchasing, IT, legal, and top administration (including the Water Board). Further, under the proposed EMA organizational approach it appears that some services units would serve both water and sewer. It would follow that lost revenue to the Water Fund would have some incremental effect on the Sewerage Fund to make up for fixed costs.
- Lost revenue to the Water Fund would not translate to less outstanding water system debt. Would an increased level of water debt service to revenue result in a lower credit rating of an independent DWSD? The rating applies to DWSD as a whole. A lower rating would potentially increase costs to borrow on the sewerage side; for such items as CSO correction and WWTP improvements.
- Some have suggested that financial impact on residents consider both water rates and sewerage rates, combined. Although this is not what WRD currently does, should this type of assessment be presented in the future then lost revenue on the water side will increase costs to those remaining in DWSD (to cover the fixed costs). This could potentially increase the residential financial costs as a % of MHI for City residents, and thus further lengthen the time needed to completed non-core CSO corrections as described in the new permit.

### Effects on NPDES Dischargers:

- 1) Which NPDES permits would be affected?  
Flint WWTP, Flushing WWTP, and Genesee Co-Ragnone WWTP are in the Flint River model/WLA, so all of these and no others are potentially affected (at least in this immediately d/s WLA).
- 2) Would we expect permit limits would be modified as a result of this proposal (and decreased background flows)?  
Since it appears the withdrawal would be near the head of or upstream of the modeled reaches, it would be assumed that all three facilities' limits would become more restrictive, depending on how we approach any load reductions to meet the DO std.
- 3) What would be the percent reduction in flow coming out of Holloway Reservoir?

A 1988 WRC 'ruling' requires that Holloway Reservoir release 85 cfs minimum in the summer, fall, and winter seasons. 232.4 cfs was used in spring modeling. 10 MGD = 15.5 cfs, so

15.5 cfs / 85 cfs = 18.2% reduction  
69.5 cfs would remain

The withdrawal is below Holloway Reservoir, so the flow out of the reservoir itself wouldn't have to change, but the flow at the first WLA facility (Flint WWTP) is reduced. Maybe the Holloway release flow could be increased 10 MGD. Erik believes that the 85 cfs minimum was to protect the fishery.

## **Benzie, Richard (DEQ)**

**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 3:45 PM  
**To:** Benzie, Richard (DEQ); Donaldson, Kristina (DEQ); Bloemker, Jon (DEQ)  
**Cc:** Shekter Smith, Liane (DEQ)  
**Subject:** FW: Flint Draft Response

At 1:30 today Mike Prysby and I attended an unplanned conference call between Director Wyant and Treasurer Dillon. Prior to the conference call I provided the director what I had put together at that point (see email below).

There was follow up discussion with the Director following the call and in addition to the response below he would like us to be prepared to discuss the following points:

1. Can we say to Treasury that KWA is a cost effective option?
2. Can we say to Treasury that DWSD is a cost effective option?
3. Regulatory authority to allow/prevent water system breakups and local vs. state decisions about associated costs
  - a. Besides Benton Township and Norton Shores/Fruitport what other systems have pulled out of a regional system and what were the DW regulatory considerations?
4. How do/can we assess the dollar value on the benefits of a DWSD Regional water system vs. the cost differential?
  - a. In the TYJT report, the status quo option for Flint with DWSD vs. KWA cost estimate differential is \$172 million.
5. What unanswered questions do we have about the DWSD options in the TYJT report?
  - a. 8/12 Blend
  - b. 12/8 Blend

SRF - cost/ben  
WW/GLC  
SOC/geom  
CONS.

I am still planning on a ODWMA meeting/conference call tomorrow morning at 9:00 to address the above and addend any additional comments before I provide a final response to the Director Wednesday afternoon in preparation for Thursday meetings.

Call me if you have any questions.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

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**Sent:** Tuesday, March 26, 2013 12:37 PM  
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ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314





RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING



DAN WYANT  
DIRECTOR

May 28, 2014

Ms. Sue F. McCormick, Director  
Detroit Water and Sewerage Department  
735 Randolph Street  
Detroit, Michigan 48226

Dear Ms. McCormick:

SUBJECT: City of Flint Reliability

Thank you for your May 9, 2014, letter regarding redundancy options for the city of Flint. Enclosed with this letter is a copy of the correspondence provided to Flint to verify that the city complies with the reliability requirements of the Safe Drinking Water Act, 1976 PA 399, as amended. As this correspondence indicates, the city currently meets the statutory requirements for reliability and capacity.

Although the city meets statutory requirements, we have encouraged them to establish mutual aid agreements with adjacent water systems that could maintain interconnections for emergency purposes as an additional public health protection measure.

Should you require further information, please contact Mr. Stephen Busch, Lansing/Jackson District Supervisor, Field Operations Section, Office of Drinking Water and Municipal Assistance (ODWMA), at 517-643-2314; buschs@michigan.gov; or at Department of Environmental Quality (DEQ), ODWMA, P.O. Box 30242, Lansing, Michigan 48909-7742.

Sincerely,

Dan Wyant  
Director  
517-284-6700

Enclosure

cc: Mr. Jim Sygo, Deputy Director, DEQ  
Ms. Liane Shekter Smith, DEQ  
Mr. Richard Benzie, DEQ  
Mr. Stephen Busch, DEQ



CITY OF DETROIT  
WATER AND SEWERAGE DEPARTMENT  
OFFICE OF THE DIRECTOR

735 RANDOLPH STREET  
DETROIT, MICHIGAN 48226  
WWW.DETROITMI.GOV

DIR000107

May 9, 2014

Mr. Dan Wyant, Director  
Michigan Department of Environmental Quality  
525 West Allegan Street  
P.O. Box 30473  
Lansing, MI 48909-7973

Director Wyant:

Regarding: City of Flint

I am writing this letter to keep the Michigan Department of Environmental Quality ("MDEQ") informed of recent developments involving the Detroit Water and Sewerage Department ("DWSD") and the City of Flint. As you are already aware, DWSD gave notice to the City of Flint in April of 2013, that it was terminating the City's contract for water service with DWSD. Pursuant to that notice, there has been on-going communication and negotiation between DWSD and the City of Flint regarding DWSD's willingness to continue to provide service to both Flint and Genesee County as non-contract customers of DWSD, until such time as either or both enter into a new long-term contract with DWSD.

As of May 1, 2014, the City of Flint stopped taking water from DWSD. DWSD staff, together with staff from Genesee County, confirmed that the valves were closed and we have noted the reduction in meter flow at our FL-01 meter to confirm this information. Further, the City of Flint has verbally informed DWSD that it does not require DWSD to provide the City with any redundancy options for water service. While DWSD has requested Flint to provide confirmation from MDEQ on this point, we have yet to receive that assurance in writing.

At the present time, DWSD continues to provide water to Genesee County. We also remain in active negotiations with Genesee County on a long-term water service and back-up service contract.

Should you have any questions regarding these matters, please do not hesitate to contact me at (313) 224-4701.

Sincerely yours,

A handwritten signature in cursive script that reads "Sue F. McCormick".

Sue F. McCormick  
Director

cc: Leann Shekter-Smith, MDEQ

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**STATE OF MICHIGAN CONTRACT NO. 271N3200089**

**CITY OF FLINT WATER SUPPLY ASSESSMENT**  
**February 2013**

For Submittal to:  
**State of Michigan, Department of Treasury**



Submitted by:

**TY** TUCKER, YOUNG,  
**JP** JACKSON, TULL INC.

CONSULTING ENGINEERS-PLANNERS  
615 Griswold Suite 800  
Detroit, Michigan 48226  
(313)983-0813 FAX (313)983-2188

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## ***Appendices***

Appendices A – Meeting Minutes

Appendix B – Cost Worksheets

## ***1. INTRODUCTION***

Tucker, Young, Jackson, Tull, Inc. (TYJT), at the request of the State Treasurer performed an analysis of the water supply options being considered by the City of Flint. The City of Flint is presently supplied potable water from the Detroit Water and Sewerage Department (DWSD). This supply is from a single 72-inch water main that terminates at a master meter located at Potter and Baxter. Additionally, downstream of the DWSD master meter, Flint supplies its customer Genesee County. The City of Flint also operates a water treatment plant that uses the Flint River as its source of supply to provide back up and redundancy to the DWSD supply as required by MDEQ.

The Karegnondi Water Authority (KWA) is planning on constructing a raw water supply system that could provide Lake Huron water to the Flint Water Treatment Plant. Flint's existing plant would be upgraded to treat the new raw water source.

The State Treasurer has appointed an emergency financial manager for the City of Flint. As such the Treasurer has requested TYJT to provide an analysis of the water supply options to assist the Treasurer in determining any potential risk and the best course going forward for supplying potable water to the City of Flint.

### ***Report Organization***

The following sections of this report are described below:

Section 2 – The basis of the analysis is described in this section. The options include the KWA option and several options offered by DWSD.

Section 3 – A significant amount of information and data was collected including memorandums, reports, drawings, financial reports, and other documents. This section summarizes the information used in the analysis.

Section 4 – This section describes the evaluation of the cost of supply for the Flint options. The costs are comprised of the initial cost of operations plus the annual rate of escalation/inflation.

Section 5 – The evaluation process used to analyze the construction costs associated with the KWA supply system is described in this section. Additionally, the cost of financing the capital requirements is described.

Section 6 – This section presents the financial review of the options considered to supply potable water to Flint. A summary of these options is also provided.

Section 7 – In addition to the financial analysis other considerations were identified that should be considered in understanding the risks and determining the best option to supply Flint. They include items related to cost, redundancy and reliability, and Flint's ability to control their future cost of water supply.

## ***2. FLINT WATER SUPPLY OPTIONS***

Two water purveyor options were evaluated; the KWA water supply system and continued supply from DWSD. Both suppliers would provide water from Lake Huron as the source. The KWA system is a raw water supply, which means that the water would have to be treated by Flint before distributing the potable water to its customers. The DWSD supply is potable or "finished" water and would not need additional treatment.

Additionally, an option for the Flint WTP to supply the City of Flint without being supplied from either DWSD or KWA was initially considered. The preliminary investigation evaluated the cost associated with the required improvements to the plant and to the Flint River dam system. Although it appeared that this was a viable option, Flint in a meeting on December 20, 2012 with the Treasury, stated that the City did not want to pursue the option and it is no longer being considered.

### ***Karegnondi Water Authority (KWA) Lake Huron Water Supply***

The KWA water supply system schematic is shown in Figure 2-1. The system is comprised of an intake in Lake Huron that supplies water to the Lake Huron Pump Station (LHPS). The LHPS lifts the water and pumps it through an approximately 22 mile long 60-inch pipeline. The pipeline terminates at a 5 MG reservoir and is then pumped from the Intermediate Pump Station (IPS) through approximately 26 miles of 60-inch and 18 miles of 30-inch pipeline to the existing Flint WTP. Downstream of the IPS, approximately half way to the Flint WTP, the 60-inch line would also supply a new Genesee County WTP.

The raw water transmission system has a 60 MGD capacity and is sized to deliver a maximum of 18 MGD to the Flint WTP with an average day supply of 12 MGD. Improvements at the Flint WTP would also be required to treat the lake water as the plant is currently designed to treat the Flint River water.

The term of the KWA contract for Flint is 40 years.

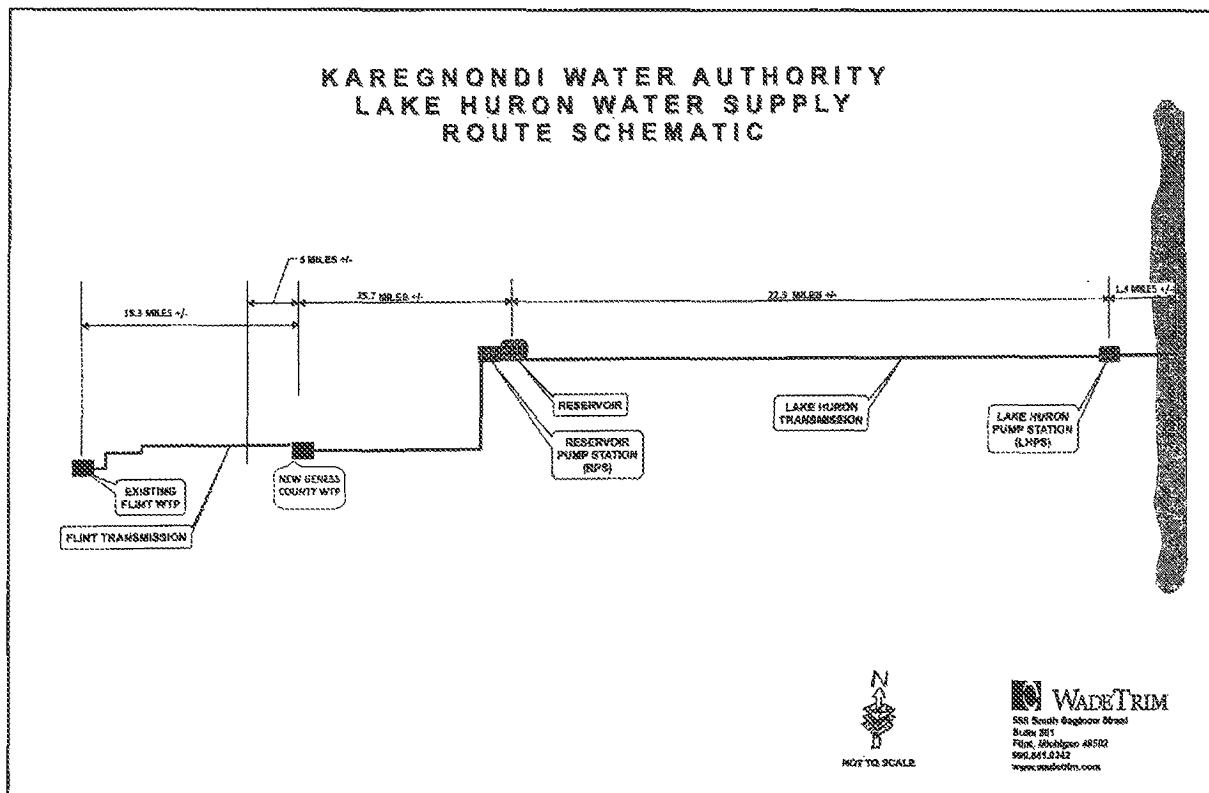


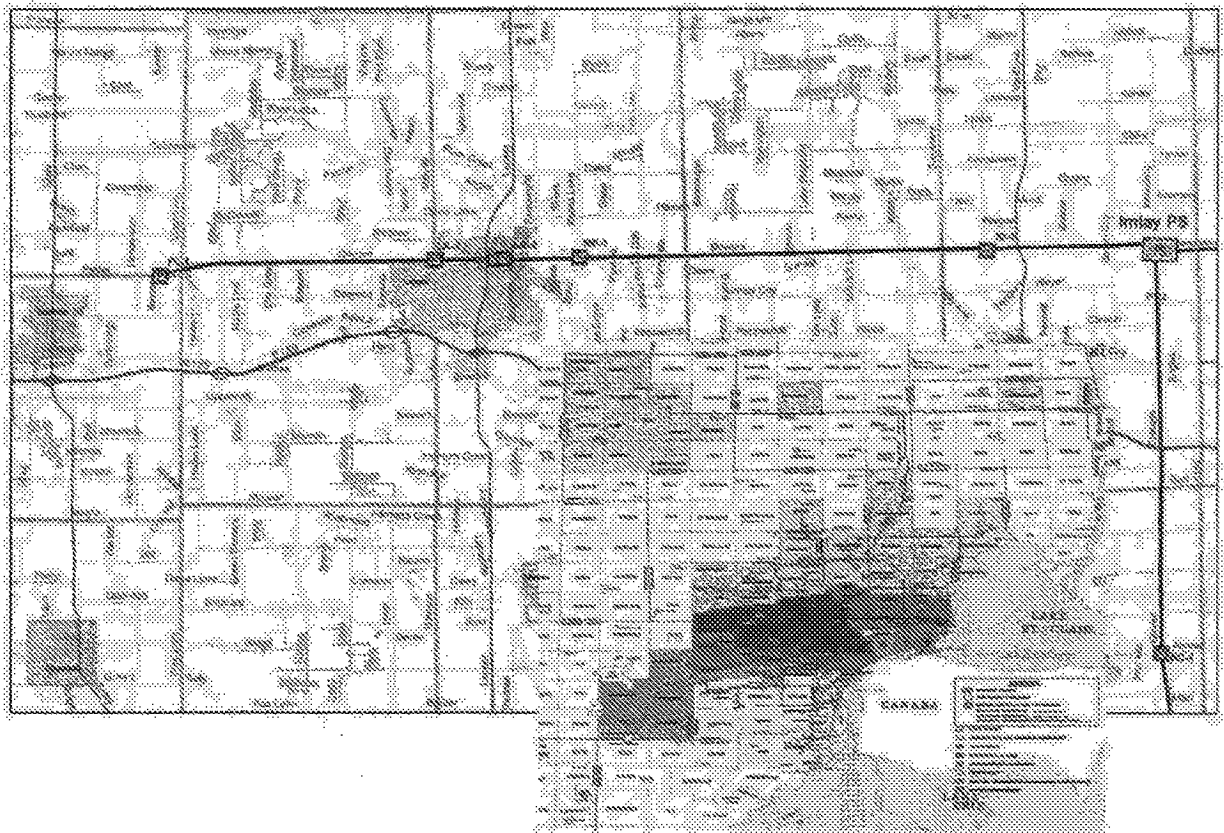
Figure 2-1: KWA Raw Water System

### ***DWSD Water System***

The DWSD system schematic is shown in Figure 2-2. Flint is currently supplied by DWSD at Master Meter FL-1, located at Potter and Baxter. Flint typically gets its water from the Lake Huron WTP, located in Fort Gratiot, Michigan; near the Lake Huron shoreline. Water is treated and pumped at the Lake Huron WTP and supplied through a 120-inch pipeline to an intermediate pump station called the Imlay Pump Station. The Imlay Pump Station has 20 MG of reservoir capacity. Depending on the time of year and the DWSD system demand, water is either bypassed directly to Flint or it is re-pumped at Imlay. It should be noted that the DWSD supply to Flint is part of a very large water system and during emergencies or outages water can be supplied from the south up to Flint in lieu of the Lake Huron facility.

*How?  
That's new*





**Figure 2-2: DWSD Water System**

The pipeline from Imlay to FL-1 is a 72-inch pipeline. It has been estimated that the 72-inch line serving Flint has a capacity in excess of 90 MGD.

DWSD has presented several contractual options to Flint and all of them are based on Flint signing a new 30 year contract. The options shown in Table 2-1 are based on two different supply points; one at the current master meter location FL-1 at Potter and Baxter (P&B) and the other at the location of the Imlay Pump Station. The reason for the varying options is to provide a lower water rate at the Imlay Station, since the DWSD rate formula is based on distance and elevation factors related to the supply location.

The rates are also dependent on the maximum amount of water DWSD supplies. As example, if DWSD supplies a maximum day demand of 18 MGD that would equal the entire amount of water required by Flint.

For the options less than the maximum of 18 MGD means that the Flint WTP would supplement the difference by supplying water treated from the Flint River. These options are known as "blending" and would allow for Flint to blend two sources of water to supply its customers; the Flint River using the Flint WTP and Lake Huron from DWSD system.

*Flint needs a blending option that starts to a baseline capacity from their WTP*

| Maximum Day Customer                | Average Day Demand |
|-------------------------------------|--------------------|
| 18 MGD Maximum Day Customer – FL-1  | 12 MGD             |
| 12 MGD Maximum Day Customer – FL-1  | 8 MGD              |
| 8 MGD Maximum Day Customer – FL-1   | 8 MGD              |
| 12 MGD Maximum Day Customer – Imlay | 12 MGD             |
| 8 MGD Maximum Day Customer – Imlay  | 12 MGD             |

**Table 2-1: DWSD Supply Options**

### ***3. DATA COLLECTION***

During the course of the investigation several documents were used to perform the analysis. The names of the documents are listed below for reference.

#### KWA and Flint

- Preliminary Engineering Report, Lake Huron Water Supply Karegnondi Water Authority, September 2009;
- Analysis of the Flint River as a Permanent Water Supply for the City of Flint, July 2011;
- Cost Comparison, KWA vs. DWSD, Letter to Mr. Kurtz, October 31, 2012;
- Lake Huron Supply Study, KWA, Appendix 20, October 2012 Preliminary Report Update, Final Report (DRAFT), October 4, 2012;
- Articles of Incorporation of Karegnondi Water Authority, endorsed in 2010;
- Karegnondi Water Authority Bylaws, October 26, 2010;
- KWA Raw Water Supply Contract;
- Flint WTP Statement of Revenues and Expenditures 09' – 12';
- GCDC Division of Water and Waste Services Financial Statements 03' – 11'; and
- Assorted emails with further clarification of questions and documentation.

#### DWSD

- Historical Rates and Charges to Flint 04' – 13';
- Historical Rates and Charges to Flint with Hypothetical Model Contract 10' – 13';
- 2013 Rates and Charges for the following options:
  - 18 MGD Maximum Day Customer at FL-1;
  - 12 MGD Maximum Day Customer at FL-1 (Flint blending\*);
  - 8 MGD Maximum Day Customer at FL-1 (Flint blending\*);
  - 12 MGD Maximum Day Customer at Imlay (Flint blending\*);
  - 8 MGD Maximum Day Customer at Imlay (Flint blending\*); and
- Assorted emails with further clarification of questions and documentation.

- \* Flint blending based on DWSD supplying two-thirds and Flint one-third of 12 MGD average day demand.

Two meetings were also held; one with DWSD and one with Flint and Genesee County representing KWA. The meetings were held on November 19, 2012 and November 20, 2012, respectively. Minutes from these meetings are included in Appendix A.

#### 4. COST OF SERVICE

Information provided by DWSD, Flint, and representatives of the KWA were used in the cost of service evaluation. To evaluate the annual escalation/inflation rate over the planning period, the rate adjustment for DWSD was estimated based on the recent rate adjustment history. For the KWA system both the estimated cost of operations when the system begins supplying water and the annual rate adjustment or inflation was evaluated. The existing cost of operations and escalation for the Flint WTP was based on actual costs provided and then adjusted depending on the scenario considered. This section describes the evaluation process and the rates used in the analysis.

##### *DWSD Water Supply*

The City of Flint has been a customer of DWSD since 1967. The Flint WTP has been maintained as a backup to the DWSD system. As indicated previously, several options were provided by DWSD depending on the type of service Flint was to select. The unit cost of water for each of these options is shown in Table 4-1. These rates are based on DWSD's FY13, which are current until July 2013.

| Description                         | Annual Water<br>Purchase<br>(MGD) | Unit Cost<br>(\$/MGD) |
|-------------------------------------|-----------------------------------|-----------------------|
| 18 MGD Maximum Day Customer – FL-1  | 12                                | 16.37                 |
| 12 MGD Maximum Day Customer – FL-1  | 8                                 | 16.31                 |
| 8 MGD Maximum Day Customer – FL-1   | 8                                 | 12.68                 |
| 12 MGD Maximum Day Customer - Imlay | 12                                | 14.38                 |
| 8 MGD Maximum Day Customer - Imlay  | 12                                | 11.11                 |

Table 4-1: Cost of DWSD Supply Options

To determine annual escalation rate, DWSD's last 10 years of history was used along with other large urban water systems in Michigan. The water systems used for benchmarking comparison were: Lansing, Grand Rapids, and Saginaw.

Table 4-2 identifies the annual and average rate of increase to Flint based on supplying water either to the current FL-1 at Potter and Baxter or Imlay. Note the last three years of the rates (FY 2011 through FY 2013) assumes that Flint's cost would be based on the new 30 year contract; FY 2011 being the first year that the new contract was available.

| Water Year | Average Unit Cost (\$/AF) | Annual Change (%) |
|------------|---------------------------|-------------------|
| 2004       | 11.06                     |                   |
| 2005       | 10.24                     | -7.4              |
| 2006       | 10.56                     | 3.1               |
| 2007       | 11.09                     | 5.0               |
| 2008       | 11.35                     | 2.3               |
| 2009       | 13.07                     | 15.2              |
| 2010       | 11.73                     | -10.3             |
| 2011       | 13.89                     | 18.4              |
| 2012       | 15.08                     | 8.6               |
| 2013       | 16.24                     | 7.7               |
| Average    |                           | 5.1               |

From FL-1

| Water Year | Average Unit Cost (\$/AF) | Annual Change (%) |
|------------|---------------------------|-------------------|
| 2004       | 11.06                     |                   |
| 2005       | 10.24                     | -7.4              |
| 2006       | 10.56                     | 3.1               |
| 2007       | 11.09                     | 5.0               |
| 2008       | 11.35                     | 2.3               |
| 2009       | 13.07                     | 15.2              |
| 2010       | 11.16                     | -14.6             |
| 2011       | 12.23                     | 9.6               |
| 2012       | 13.28                     | 8.6               |
| 2013       | 14.32                     | 7.8               |
| Average    |                           | 5.1               |

From Imlay

Table 4-2: Recent DWSD Water Rates

Audited financial reports were used to determine the rate of inflation associated with other three large municipal systems. The results are shown in Table 4-3.

| Water System | Analysis Period | Inflation Rate (%) |
|--------------|-----------------|--------------------|
| Lansing      | 05'-12'         | 4.6                |
| Grand Rapids | 04'-11'         | 1.6                |
| Saginaw      | 04'-11'         | 7.0                |

Table 4-3: O&M Inflation Rates of Other Large Water Systems

Based on the information analyzed from DWSD and the other communities, it was determined that a fair annual rate of inflation for operations and maintenance cost for the analysis should be 4.4%. The 4.4% has historical significance from Flint's current water supplier and falls within the range of the other communities.

### ***KWA Water Supply***

The initial projected O&M cost for the KWA supply would be comprised of KWA's O&M costs as well as Flint's O&M costs. Because there was limited information provided, the initial estimated rate of \$1.50/MCF was used. This rate is based on information from the cost comparison analysis attached to the letter to Mr. Kurtz, dated October 31, 2012.

The KWA cost evaluation used an annual O&M inflation rate of 5%. To validate this rate a similar analysis to DWSD's operations and maintenance annual rate of inflation was used. First, in discussions with Flint and the Genesee County Drain Commission (GCDC), they believed that the annual rate of inflation for the new KWA system would be similar to the GCDC Water & Waste Services (WWS). Additionally, two large transmission systems were used to benchmark the inflation rates: the Southeastern Oakland County Water Authority (SOCWA) and the Ypsilanti Utility Community Authority (YUCA). Although both of these systems transmit finished water opposed to raw water, they were considered similar enough for comparison as they are comprised of only large water mains, pumping facilities and storage.

Once again audited financial statements were used to calculate the inflation rates. A summary of the findings are shown in Table 4-4. Based on the fact that the information analyzed showed a large difference between the two systems, it was determined that the KWA assumption of 5% was a good rate of inflation to use in the financial analysis. This rate is almost equally between the GCDC rate and the other two transmission systems.

| System   | Time Evaluated | Inflation Rate (%) |
|----------|----------------|--------------------|
| GCDC WWS | 03' - 11'      | 10.5               |
| SOCWA    | 04'-12'        | —                  |
| YUCA     | 04'-12'        | 0.7                |

**Table 4-4: O&M Inflation Rates of Other Comparable Systems to KWA**

### ***Flint WTP***

The Flint WTP currently serves as a backup supply to the DWSD service to Flint. To maintain backup operations, the City of Flint operates the plant approximately 20 days each year. Flint indicated that the average production rate when they operate is 11 MGD.

For the blending options and the KWA supply considered, Flint would be required to operate its plant all year around. Therefore, their operating and maintenance costs were evaluated and adjusted to determine an annual cost associated with year-round operations.

The Flint WTP provided three years of operating costs for the assessment. Additionally, reports listed in Section 3 were also used as reference to determine both operating costs for the plant processing Flint River water (blending options) and Lake Huron raw water (KWA option).

Major cost centers were analyzed to estimate annual operation and maintenance. They included: labor, utilities, chemicals and residual management. In general, as recommended by the Flint plant staff, labor and overhead were increased from the current costs by two-thirds. Additionally, variable costs for power, chemicals and residual cost were increased to estimate full time treatment at the Flint WTP. Data from the KWA Preliminary Report and annual operating data for the Flint WTP (provided separately) were analyzed to make these forecasts.

The annual operating and maintenance costs developed for Flint WTP used are shown in Table 4-5.

| Source of Supply                 | Operating Days<br>Preliminary Forecast | Estimated Annual<br>Operating Cost |
|----------------------------------|--|------------------------------------|
| Flint River (Blending with DWSD) | 4                                      | \$5,895,097                        |
| Lake Huron (Supplied by KWA)     | 12                                     | \$7,913,118                        |

**Table 4-5: FY 13 O&M Costs for Year-round Operations**

It was determined that a fair annual rate of inflation for operations and maintenance cost for the Flint WTP plant should be 4.51%. The 4.51% is an average of Lansing, Grand Rapids and Saginaw facilities.



## 5. CAPITAL REQUIREMENTS

Large capital investments would be required by Flint and GCDC to construct the KWA supply system. Furthermore, some of the options presented by DWSD (supply point from Imlay) would require the purchase by Flint of DWSD's 72-inch water main. Performing the financial analysis, therefore, required an analysis of the KWA construction cost estimate for the transmission system and Flint WTP improvements.

Revenue bonds were also identified as the source of financing the new supply system and associated improvements. This section describes the assumptions made and the interest used for financing the improvements.

### *KWA Supply System*

The most current cost estimate of the KWA system was presented in the document titled; Lake Huron Supply Study, KWA, Appendix 20, October 2012 Preliminary Report Update, Final Report (DRAFT), October 4, 2012. The cost of construction is estimated at \$272,421,558. Flint's portion would be 30% or \$81,726,467.

Due to the significance of this expenditure, a detailed review of the cost was performed and is presented in this section. The analysis was performed based on the main elements of the supply system: the lake intake, the two pumping stations, and the transmission pipeline. Additionally, an analysis was performed related to construction contingencies and other costs such as engineering, legal, and administration.

### **Lake Intake**

KWA representatives indicated in a meeting in November that the design documents for the intake were at 90% and that it was planned for advertisement in January 2013. A summary of the estimate is shown in Table 5-1.

| Item            | Estimate            |
|-----------------|---------------------|
| Intake and Crib | \$22,076,850        |
| ELAC at 25%     | 5,519,213           |
| Property        | 2,300,000           |
| <b>Total</b>    | <b>\$29,896,063</b> |

Table 5-1: KWA Intake Cost Estimate

Based on the evaluation, it appeared that the cost estimate was reasonable. Given that the design was nearly complete, the engineering, legal, administration, and construction contingencies (ELAC) at 25% were also found to be appropriate.

## Pumping Stations

KWA representatives indicated that the pump stations were estimated at a level of design less than 15%. Therefore, in addition to an evaluation of their cost estimate, other water pumping station costs were used for comparison. Additionally, contractors were also contacted for costs. Table 5-2 summarizes the KWA cost estimate compared to our cost estimate performed for the Treasury.

| Itemization                                      | KWA | Estimate     | ELAC | Estimate     |
|--|-----|--------------|------|--------------|
| Pumping Stations                                 |     | \$24,618,080 |      | \$54,573,314 |
| Land for Intermediate Pump Station and Reservoir |     | —            |      | 75,000       |
| Subtotal   |     | \$24,618,080 |      | \$54,648,314 |
| ELAC for Construction                            | 25% | 6,154,520    | 30%  | 16,394,494   |
| Total  |     | \$30,772,600 |      | \$71,042,808 |

Table 5-2: Pumping Stations Cost Estimate

Two things to note regarding the difference in the cost estimates; firstly, there is a large difference in the cost estimates of the pumping stations. The estimate developed for the Treasury used several other pumping stations construction costs from Southeastern Michigan and discussions with contractors. These costs were then computed on a \$/MG's for comparison.

Secondly, our estimate for the Treasury is based on an ELAC of 30% instead of KWA's 25%. Although 25% was acceptable for the intake, it is believed to be too low for the pumping station estimate given that the engineering effort is less than 15%.

## Transmission Main

Although the specific route for the transmission main was not provided, an estimate was calculated based on the general information provided. Once again, the KWA estimate was based on a level of design less than 15%. The estimate performed for the Treasury used the line items provided by KWA for the pipeline and also consulted with contractors to evaluate the cost of construction. The comparison is shown in Table 5-3.

Although the cost of construction of the pipeline is similar, a value of 30% was used for ELAC due to the level of design. Additionally, KWA did not believe there would be any additional costs for easements; however, this did not seem practical. Therefore an estimate for acquiring the easements was added to the Treasury estimate and is based on the 277 easements identified by KWA. The cost shown includes surveying, legal, engineering, administration, etc.

| Description           | Costs | Estimate      | Unit | Estimate      |
|-----------------------|-------|---------------|------|---------------|
| Transmission Mains    |       | \$166,202,316 |      | \$167,419,530 |
| ELAC for Construction | 25%   | 41,550,579    | 30%  | 50,225,859    |
| Subtotal              |       | \$207,752,895 |      | \$217,645,389 |
| Easements             |       | —             |      | 1,166,170     |
| Total                 |       | \$207,752,895 |      | \$218,811,559 |

Table 5-3: Transmission Pipeline Cost Estimate

### Other KWA Costs

In prior estimates of the construction cost, KWA used an ELAC of 37%. In this case it could be considered that the engineering effort associated with the design would have been included. However, it is believed that KWA's reduced ELAC of 25%, does not include the design effort. Additionally, it would be prudent to assume that the owner would want a construction manager during construction of this large project. A summary of these costs are shown in Table 5-4.

| Description   | Estimate     |
|---|--------------|
| Design Engineering for Pumping Stations and the Transmission Pipeline   | \$16,939,581 |
| Construction Management at 5% of Project Cost Estimate of \$217,645,389 | 14,434,609   |
| Administration  | 349,440      |
| Legal, Easements, Contract Documents                                    | 831,000      |
| Total   | \$32,554,630 |

Table 5-4: Other Costs

### Summary Comparison

A summary of the two cost estimates are shown in Table 5-5. Based on the comparison, the estimate performed by TYIT shows a higher cost to Flint by approximately \$25,000,000.

Note that there are two other costs shown in the summary that were not previously addressed; power and backup power. Regarding the cost of providing power to the pumping facilities, the cost of \$4,000,000 appears reasonable.

did they ask should we?

Not needed for Flint if they maintain River intake option

*we need to clarify - maybe needed for GC, but not Flint*

The KWA has repeatedly indicated that backup power is not needed. Backup power is a standard practice in the water industry. Furthermore, a loss of power at either pumping facility will prevent the supply of water to both Flint and Genesee County. For these reasons, the cost of providing backup power was included in our estimate for the Treasury.

| Item/Category                          | 2009 Estimate         | 2017 Estimate         |
|--|-----------------------|-----------------------|
| Intake/Crib                            | \$ 27,596,063         | \$ 27,596,063         |
| Pump Stations                          | 30,772,600            | 71,042,808            |
| Transmission Mains                     | 207,752,895           | 217,645,389           |
| Power                                  | 4,000,000             | 4,000,000             |
| Redundant Power for PS                 |                       | 1,273,200             |
| Land for Lake Huron Pumping Station    | 2,300,000             | 2,300,000             |
| Design Engineering/PS and Transmission |                       | 16,939,581            |
| Construction Management                |                       | 14,434,410            |
| Administration                         |                       | 349,440               |
| Legal/Easement/Contract Documents      |                       | 831,000               |
| Easements                              |                       | 1,166,170             |
| <b>Total</b>                           | <b>\$ 272,421,558</b> | <b>\$ 357,578,060</b> |
| <b>Flint Share at 30%</b>              | <b>\$81,726,467</b>   | <b>\$107,273,418</b>  |

Table 5-5: Total Cost Comparison

### Flint WTP Improvements

The KWA analysis identified capital costs required to convert the existing WTP from river water treatment to treating lake water. The cost estimate was identified as \$7,100,000 in the 2009 report. This number was used in our analysis, since additional information was not provided. For the purpose of the financial analysis; however, the \$7,100,000 was increased by 3% each year for three years to account for inflation.

### DWSD Imlay Station Supply Options

The options identified by DWSD to supply service to Flint at the Imlay Pump Station would require Flint to purchase the 72-inch water main from Imlay to Master Meter, FL-1. The pipeline is approximately 25 miles long. The estimated cost provided by DWSD for estimating purposes is \$4,700,000.

### Financing

The cost of financing the revenue bonds for the capital work was investigated. Based on conversations with local financial advisors knowledgeable in bond financing, an interest rate of 5% for the 25 year

*Could inquire of GC?*

*What about replacement cost?*

*what did it say was needed? seems like it would be less? neg'd? - this pipe is half way thru water IFE-*

## 6. FINDINGS

Using the information described in the previous sections, a cost evaluation was conducted for the KWA supply and the DWSD options. Individual worksheets for each option are provided in Appendix B. For the purpose of comparison a 30 year period was used. This period includes the 3 year construction period, the 25 loan period and an additional two years to get a sense of the cost of operation after the loans have been paid.

There were three separate cost sheets prepared for the KWA option. The first cost sheet (KWA) is based on the cost estimate provided by KWA. The costs provided assumed no overruns or delay in construction. With KWA's own assumptions of an overrun in construction of 15% and a one year delay in operations, the KWA estimated cost becomes \$686,375,920 through Year 2042.

Since this cost estimate did not appear to include the financing of revenue bonds, another cost sheet (KWA-1) was developed that included KWA's cost estimate without overruns with the additional finance costs associated with the revenue bonds. A final cost sheet (KWA-2) includes the cost associated with the revenue bonds based on the estimate provided by TYIT for the Treasury.

A summary of the cost sheets provided in Appendix B are shown in Table 6-1. Figure 6-1 shows the cumulative annual costs associated with each option.

| Options   | Estimated<br>Cost through<br>2042 (\$) | Ranking<br>by Cost |
|---|--|--------------------|
| DWSD 8 MGD Maximum Day at Imlay Station             | 634,795,488                            | 1                  |
| KWA (10/31/12 No Overruns, As Provided)*            | 649,775,166                            | 2                  |
| DWSD 8 MGD Maximum Day at FL-1                      | 672,671,705                            | 3                  |
| KWA-1 (10/31/12 No Overruns with Cost of Financing) | 707,279,715                            | 4                  |
| DWSD 12 MGD Maximum Day at Imlay Station            | 725,576,803                            | 5                  |
| DWSD 12 MGD Maximum Day at FL-1                     | 762,110,308                            | 6                  |
| KWA-2 (Treasury Estimate)                           | 766,784,313                            | 7                  |
| DWSD 18 MGD Maximum Day at FL-1                     | 821,226,268                            | 8                  |

\* \$686,375,920 with 15% overrun in construction and a one year delay in operations

**Table 6-1: Total Cost of Options through 2042**

Based on the analysis, it is prudent to assume the KWA water supply option costs would be somewhere between the KWA-1 and KWA-2 options. Therefore, the analysis indicates that the two DWSD options of supplying 8 MGD on a maximum day and up to 8 MGD on average are the least cost options for Flint. These options allow Flint to maximize the use of existing assets; the City of Flint's (the Flint WTP) and DWSD's (the existing 72-inch main).

Additionally, in recent conversations with the Treasury another option was discussed that could potentially be the most cost-effective solution. Currently the Flint WTP serves as a backup if service is

period was considered acceptable. This is based on a Standard and Poor's bond rating of A without insurance.

Additional costs associated with the bond include the reserve and bond issuance fee. The bond holders will require a reserve of approximately 10% of the loan to be held for the 25 year payment period. The cost associated with the bond issuance has been estimated at 2.25% of the principal borrowed for the KWA project and 3% for the smaller loan associated with the Flint WTP improvements or the purchase of the 72-inch main.

Furthermore, since no revenue will be generated to pay on the bonds for the first three years that the system is being constructed, the cost associated with capitalizing the interest was also included.

Finally, interest on the reserve will be provided back to KWA and Flint. Although the interest is currently less than 1%, it was determined that a 3% rate would be more prudent long-term.

lost through either the DWSD or KWA pipeline. If the a twin pipe paralleling the DWSD 72-inch water main were constructed with interconnects with the 72-inch line, then the new water main could serve as the backup to Flint and the Flint WTP could be abandoned or potentially sold to Genesee County for their use.

The construction of the parallel pipeline would be considered in the DWSD capital expenditure as a Common to All (CTA) cost. This means that the capital cost of the pipeline would be shared by all DWSD customers and not just by Flint. Preliminary analysis of this option appears to be the most cost-effective of all the options discussed. However, a more thorough cost analysis is warranted and this approach would require an agreement between Flint and DWSD.

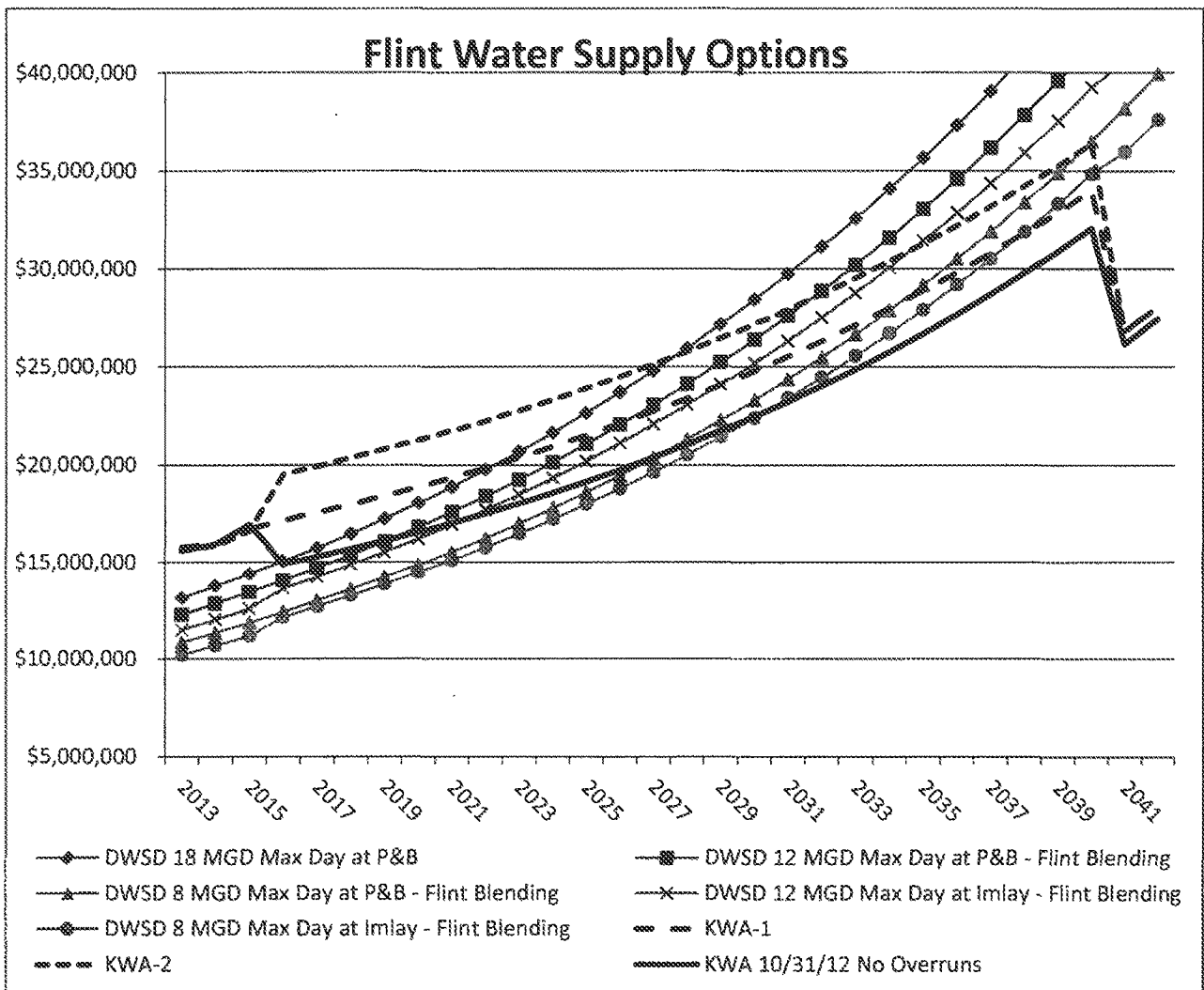


Figure 6-1: Flint Water Supply Options through 2042

## ***7. OTHER CONSIDERATIONS***

As part of the investigation other issues were identified that may result in risks to Flint that should be considered by the Treasury in determining how Flint's potable water should be supplied. These issues are related to redundancy and reliability, other items affecting cost, and Flint's desire to control its own destiny related to its water supply. These are described further below.

### ***Redundancy/Reliability***

In one of the first meetings related to this task assessment, which was held on November 1, 2012, the Genesee County Drain Commissioner, Mr. Jeff Wright, stated that one of the main reasons for pursuing the KWA supply option related to the lack of reliability of the DWSD system. He pointed to the Northeast blackout of 2003; a widespread power outage that occurred throughout parts of the Northeastern and Midwestern United States and Ontario, Canada, on Thursday, August 14, 2003. He stated that Flint and Genesee County were out of water for several days.

It is worth noting that this was a power outage of historic proportions that affected millions of Americans. However, DWSD did begin supplying water again relatively quickly in comparison to other major cities impacted by the same power outage.

Furthermore, the KWA supply system offers less redundancy to Flint than the current DWSD system. Under both options, Flint is supplied by a single pipeline; however, DWSD has backup power at all of its major facilities supplying Flint. The KWA system will not have a redundant power at its pumping facilities. This would be a major risk.

Currently, backup to the DWSD system for Flint is Flint's WTP using the Flint River as the source of supply. KWA has stated that the Flint River source would also be used as backup to Flint if the KWA supply through its pipeline was lost. However, since the Flint WTP would be upgraded to treat Lake Huron water under the KWA option, using the Flint River as a backup source would require the Flint WTP to maintain two process treatment streams.

In addition to Flint and Genesee County, the DWSD's 72-inch main supplies Imlay City, Mayfield and the Greater Lapeer County Utilities Authority (GLCUA). The volume of water contained within the 72-inch main is approximately 30 MG. Only supplying these three remaining communities would cause the water age to increase dramatically; somewhere in excess of three weeks old, before reaching the customers' master meters. Since the half-life of chlorine in the DWSD system is approximately 5 days, the chlorine would most probably be near zero requiring re-chlorination of the finished water upstream of the master meters.

Re-chlorinating is a costly and risky process due to the instability of chlorine gas. It is unknown whether DWSD would pursue this improvement or possibly abandoned the 72-inch pipeline.

If Flint is supplied by the KWA system, then DWSD supplying their other customers along the 72-inch water main may be reconsidered. Since the KWA system is a raw water supply, the communities would



either have to build a treatment facility to treat the water from KWA or find another water source for their communities.

### ***Additional Cost and Risk Considerations***

The design of the KWA supply and the construction of the system have not been completed; therefore, final costs and time to complete are unknown. Cost overruns and delays in completion will both negatively impact Flint's final cost. As example, if the project is not completed within the three year period, payment on the bonds will be due, but the revenue source needed from the sale of water could not be provided.

Furthermore, there is always a risk with large water system construction; especially those including an intake in the Great Lakes, pumping stations and rehabilitation of older water treatment plants. These risks include the potential of explosive gases in tunneling below Lake Huron, changing site conditions associated with the large number of miles of pipe installation and rehabilitating an older WTP, and the startup and debugging of the entire pumping system.

Flint has indicated that they have a high water loss. Not addressing this issue prior to sizing the Flint supply pipeline from KWA could cause the water main to be oversized along with its incremental cost in construction.

Also, the KWA supply option appears to run counter to the Treasury's Competitive Grant Assistance Program (Formerly EVIP Grant). This program has been put in place to allow for communities to consolidate their services and save money. Two existing customers of DWSD (Flint and Genesee County) along with the potential of others customers (GLCUA, Mayfield, Imlay City) separating to from another water system is in contradiction to the program.

Finally, there is a concern over the ability of smaller systems (KWA) over larger systems (DWSD) to pay for future unfunded mandates and regulations. Obviously, identifying regulation requirements over 30 years is hard to determine. However, it is widely accepted that a large system has greater ability to respond to unfunded mandates because the cost can be distributed over a large customer base.

### ***Flint's Autonomy***

Flint has indicated that a major point of consideration is that they have no control over the rate increases issued to Flint by DWSD. All other counties supplied by DWSD have representatives on the Board of Water Commissioners (BOWC). The BOWC is one of the governing bodies that approve the water rates. Since Flint and Genesee County do not have a representative on the BOWC, Flint believes they are held "hostage" to DWSD's rates and cost of service.

This issue was stated in Flint's handout at the November 1, 2012 meeting. The handout is titled, "Flint Water Supply Future." However, it is worth noting in the same handout, Flint also identifies similar concerns with the governing board of the KWA system. Notably, that although Flint and Genesee County will be the only customers and Flint will be responsible for 30 percent of the construction cost,

they will have a minority vote on the KWA board. Furthermore, there are other communities (Lapeer County, the City of Lapeer, and Sanilac County) that sit on the board and vote. However, they are not purchasing water nor contributing to the construction costs.

STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

State of Michigan, Department of Treasury

**Appendix A: Meeting Minutes**

## MEETING MINUTES

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**IN ATTENDANCE:** Sue McCormick, DWSD Director  
Darryl Latimer, DWSD Deputy Director  
George Karmo, TYJT  
Awni Qaqish, TYJT  
Dave Guastella, TYJT

**DATE:** November 24, 2012

**PURPOSE OF MEETING:** Meeting with DWSD for the Indefinite-scope, Indefinite-delivery Contract Number 00383, 2012 Professional General Architectural/Engineering Services – City of Flint Water Supply Assessment

**PREPARED BY:** Dave Guastella

A meeting was held at the DWSD Main Office Building on November 19, 2012 to discuss the water supply options being presented by DWSD to the City of Flint. The main items discussed generally followed the attached DWSD Discussion/Questions that were provided to the Department prior to the meeting. A summary of the key points discussed are provided below.

### DISCUSSION ITEMS

1. Question/Discussion Item: Verify that the four options presented at the November 1, 2012 meeting are still available for consideration:
  - a. Supplied from Potter & Baxter using the new model contract (assume a Maximum Day Customer),
  - b. Supplied from Imlay Station,
  - c. Finished un-pumped supply from Lake Huron WTP, and
  - d. Raw un-pumped supply from Lake Huron WTP.

*DWSD prefers to focus on the first two supply point listed; from the current location at Potter & Baxter and at the Imlay Pump Station as these apply specifically to Flint.*

*DWSD provided the attached summary regarding the current costs to Flint based on the various options that DWSD is offering. The savings associated with each option is provided as well. As example, if Flint were to purchase water from the supply point located at Imlay Station, the current cost to Flint would be \$5,661,000 and it would be a savings of nearly 50%*

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*compared to Flint's current rate.*

2. Question/Discussion Item: What additional capital improvements will be required for each option?

*If Imlay Pump Station is selected as the supply point then Flint would need to purchase the 72-inch water main and an agreement to supply Lapeer would need to be worked out. DWSD believes that this could be worked out through a "wheeling" charge over the 72-inch main or possibly moving the supply point downstream of the Lapeer connection.. DWSD estimates the value of the water main at \$4.7M. Flint could bond for this amount or DWSD could include the cost into Flint's rate.*

3. Question/Discussion Item: Are there other options being presented that should be considered (e.g., blending)?

*Only the two options indicated above are currently being considered and both would include blending; DWSD providing 2/3 of the supply and the Flint WTP providing the other 1/3.*

4. Question/Discussion Item: To evaluate each option over the 25 year planning period, provide:
- a. Annual water rate for Flint for 2002 through 2012, and the
  - b. Projected annual rate adjustment for each option. What are the proposed measures to keep the rate adjustments down in the future?

*DWSD provided the attached historical rates from 2002 through 2012 for the existing water contract with Flint. The attachment also includes what the rates would have been if Flint had signed the new model contract or had taken service from Imlay. These rates were provided back to 2010.*

*DWSD believes that 5% would be a good estimation to assume for their annual escalation in rates over the 25 year planning period.*

5. Question/Discussion Item: Flint stated a 10% increase in the capacity charge. What number did DWSD provide Flint?

*It was unclear to DWSD where the 10% increase in capacity charge stated by Flint came from. DWSD's information provided shows an average of 6.3%. DWSD offered a meeting with TYJT to discuss how the fixed and commodity charges are allocated.*

6. Question/Discussion Item: Flint financial comparison is based on the initial Cost of \$14,413,858, which includes \$2,725,538 for Flint WTP operating cost; i.e, DWSD charge is \$11,688,320. How good is this number?

*DWSD indicated that the charge of \$11,638,320 is good through 6/30/13 based on their existing contract with DWSD.*

7. Question/Discussion Item: KWA's initial charge to Flint is based on 12 MGD. Is DWSD charge

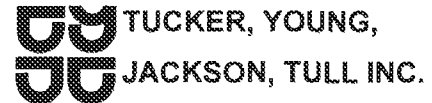
Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

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based on 12 MGD?

*Yes, 12 MGD from DWSD would be a maximum with Flint supplying 6 MGD for a total of 18 MGD (2/3 vs. 1/3).*

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**Indefinite-scope, Indefinite-delivery Contract Number 00383  
2012 Professional General Architectural/Engineering Services**

**CITY OF FLINT WATER SUPPLY ASSESSMENT**

DWSD Discussion/Questions for the November 19, 2012 Meeting

1. Verify that the four options presented at the November 1, 2012 meeting are still available for consideration:
  - c. Supplied from Potter & Baxter using the new model contract (assume a Maximum Day Customer),
  - d. Supplied from Imlay Station,
  - e. Finished un-pumped supply from Lake Huron WTP, and
  - f. Raw un-pumped supply from Lake Huron WTP.
2. What additional capital improvements will be required for each option?
3. Are there other options being presented that should be considered (e.g., blending)?
4. To evaluate each option over the 25 year planning period, provide:
  - g. Annual water rate for Flint for 2002 through 2012, and the
  - h. Projected annual rate adjustment for each option. What are the proposed measures to keep the rate adjustments down in the future?
5. Flint stated a 10% increase in the capacity charge. What number did DWSD provide Flint?
6. Flint financial comparison is based on the initial Cost of \$14,413,858, which includes \$2,725,538 for Flint WTP operating cost, i.e DWSD charge is \$11,688,320. How good is this number?
7. KWA's initial charge to Flint is based on 12 MGD. Is DWSD charge based on 12 MGD?

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

Summary of DWSD Cost Allocations to Flint Under Various Scenarios  
**Flint Only**

|                           | Revenue<br>Requirement | Rates and Charges |           |               |
|---------------------------|------------------------|-------------------|-----------|---------------|
|                           |                        | Fixed             | Commodity | Avg Unit Cost |
| 1 Status Quo              | 11,461,700             | 357,271           | 12.46     | 19.91         |
| 2 Model Contract          | 9,732,100              | 275,517           | 11.16     | 16.90         |
| 3 Change                  | (1,729,600)            | (81,754)          | (1.30)    | (3.00)        |
| 4 % Change                | -15.1%                 | -22.9%            | -10.4%    | -15.1%        |
| 5 Max Day Only            | 9,424,700              | 271,010           | 10.72     | 16.37         |
| 6 Change                  | (307,400)              | (4,507)           | (0.44)    | (0.53)        |
| 7 % Change                | -3.3%                  | -1.7%             | -4.1%     | -3.3%         |
| 8 Allow Blending          | 6,302,800              | 182,369           | 10.72     | 16.42         |
| 9 Change                  | (3,121,900)            | (88,641)          | 0.00      | 0.05          |
| 10 % Change               | -49.5%                 | -48.6%            | 0.0%      | 0.3%          |
| 11 Imlay City Connections | 5,800,700              | 170,912           | 9.77      | 15.11         |
| 12 Change                 | (502,100)              | (11,457)          | (0.95)    | (1.31)        |
| 13 % Change               | -8.7%                  | -6.7%             | -9.7%     | -8.7%         |
| 14 Cumulative Change      | (5,661,000)            | (186,359)         | (2.69)    | (4.80)        |
| 15 Cumulative %Change     | -49.4%                 | -52.2%            | -21.6%    | -24.1%        |

|                          | Assumptions           |                       |                         |                          |                          |                     |
|--------------------------|-----------------------|-----------------------|-------------------------|--------------------------|--------------------------|---------------------|
|                          | Avg Day<br><i>mgd</i> | Max Day<br><i>mgd</i> | Peak Hour<br><i>mgd</i> | Distance<br><i>miles</i> | Elevation<br><i>feet</i> | Sales<br><i>mgd</i> |
| 1 Status Quo             | 11.8                  | 21.6                  | 22.6                    | 52.0                     | 866                      | 11.8                |
| 2 Model Contract         | 11.8                  | 17.9                  | 18.8                    | 52.0                     | 866                      | 11.8                |
| 3 Max Day Only           | 11.8                  | 17.9                  | 17.9                    | 52.0                     | 866                      | 11.8                |
| 4 Allow Blending         | 7.9                   | 11.9                  | 11.9                    | 52.0                     | 866                      | 7.9                 |
| 5 Imlay City Connections | 7.9                   | 11.9                  | 11.9                    | 45.2                     | 866                      | 7.9                 |



## Recent DWSD Water Rates to Flint

| FY                                 | Rates and Charges |                     |                         | Annual Change  |                     |                         | Average       |
|------------------------------------|-------------------|---------------------|-------------------------|----------------|---------------------|-------------------------|---------------|
|                                    | Fixed<br>\$/mo    | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Fixed<br>\$/mo | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Annual Change |
| <i>As Charged</i>                  |                   |                     |                         |                |                     |                         |               |
| 2004                               |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005                               |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006                               |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007                               |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008                               |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009                               |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010                               |                   | 14.32               | 14.32                   |                |                     | 9.6%                    |               |
| 2011                               | 182,301           | 14.29               | 16.01                   |                | -0.2%               | 11.8%                   |               |
| 2012                               | 443,096           | 13.36               | 17.53                   | 143.1%         | -6.5%               | 9.5%                    |               |
| 2013                               | 707,000           | 12.46               | 19.12                   | 59.6%          | -6.7%               | 9.1%                    | 6.3%          |
| <i>Hypothetical Model Contract</i> |                   |                     |                         |                |                     |                         |               |
| 2004                               |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005                               |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006                               |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007                               |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008                               |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009                               |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010                               |                   | 13.96               | 13.96                   |                |                     | 6.8%                    |               |
| 2011                               | 145,918           | 13.74               | 15.28                   |                | -1.6%               | 9.5%                    |               |
| 2012                               | 378,968           | 12.58               | 16.57                   | 159.7%         | -8.4%               | 8.4%                    |               |
| 2013                               | 597,323           | 11.63               | 17.93                   | 57.6%          | -7.6%               | 8.2%                    | 5.5%          |

TFG

## Recent DWSD Water Rates to Flint

| FY  | Rates and Charges |                     |                         | Annual Change  |                     |                         | Average       |
|---|-------------------|---------------------|-------------------------|----------------|---------------------|-------------------------|---------------|
|   | Fixed<br>\$/mo    | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Fixed<br>\$/mo | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Annual Change |
| <i>As Charged</i>                               |                   |                     |                         |                |                     |                         |               |
| 2004  |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005  |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006  |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007  |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008  |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009  |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010  |                   | 14.32               | 14.32                   |                |                     | 9.6%                    |               |
| 2011  | 182,301           | 14.29               | 16.01                   |                | -0.2%               | 11.8%                   |               |
| 2012  | 443,096           | 13.36               | 17.53                   | 143.1%         | -6.5%               | 9.5%                    |               |
| 2013  | 707,000           | 12.46               | 19.12                   | 59.6%          | -6.7%               | 9.1%                    | 6.3%          |
| <i>Hypothetical Model Contract - Flint Only</i> |                   |                     |                         |                |                     |                         |               |
| 2004  |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005  |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006  |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007  |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008  |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009  |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010  |                   | 11.73               | 11.73                   |                |                     | -10.3%                  |               |
| 2011  | 70,060            | 12.45               | 13.89                   |                | 6.1%                | 18.4%                   |               |
| 2012  | 175,882           | 11.47               | 15.08                   | 151.0%         | -7.9%               | 8.6%                    |               |
| 2013  | 272,923           | 10.65               | 16.24                   | 55.2%          | -7.1%               | 7.7%                    | 4.4%          |

TFG

PRELIMINARY

THE FOSTER GROUP

11/20/12

# Recent DWSD Water Rates to Flint

| FY  | Rates and Charges |                     |                         | Annual Change  |                     |                         | Average       |
|---|-------------------|---------------------|-------------------------|----------------|---------------------|-------------------------|---------------|
|   | Fixed<br>\$/mo    | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Fixed<br>\$/mo | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Annual Change |
| <i>As Charged</i>                                       |                   |                     |                         |                |                     |                         |               |
| 2004  |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005  |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006  |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007  |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008  |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009  |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010  |                   | 14.32               | 14.32                   |                |                     | 9.6%                    |               |
| 2011  | 182,301           | 14.29               | 16.01                   |                | -0.2%               | 11.8%                   |               |
| 2012  | 443,096           | 13.36               | 17.53                   | 143.1%         | -6.5%               | 9.5%                    |               |
| 2013  | 707,000           | 12.46               | 19.12                   | 59.6%          | -6.7%               | 9.1%                    | 6.3%          |
| <i>Hypothetical Model Contract - Flint Only @ Imlay</i> |                   |                     |                         |                |                     |                         |               |
| 2004  |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005  |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006  |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007  |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008  |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009  |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010  |                   | 11.16               | 11.16                   |                |                     | -14.6%                  |               |
| 2011  | 65,919            | 10.88               | 12.23                   |                | -2.5%               | 9.6%                    |               |
| 2012  | 165,275           | 9.89                | 13.28                   | 150.7%         | -9.1%               | 8.6%                    |               |
| 2013  | 255,580           | 9.09                | 14.32                   | 54.6%          | -8.1%               | 7.8%                    | 2.9%          |

## MEETING MINUTES

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**IN ATTENDANCE:** Ed Kurtz; Flint Emergency Financial Manager, City of Flint  
Dayne Walling; Mayor, City of Flint  
Mike Brown, City of Flint  
John O'Brien, Genesee County  
Howard Croft, City of Flint  
Dwayne "Duffy" Johnson, City of Flint  
Brent Wright, City of Flint  
Awni Qaqish, TYJT  
Dave Guastella, TYJT

**DATE:** November 24, 2012

**PURPOSE OF MEETING:** Meeting with the City of Flint for the Indefinite-scope, Indefinite-delivery Contract Number 00383, 2012 Professional General Architectural/Engineering Services – City of Flint Water Supply Assessment

**PREPARED BY:** Dave Guastella

A meeting was held at the City of Flint Municipal Center on November 20, 2012 to discuss the water supply option being presented by the Karegnondi Water Authority (KWA) to the City of Flint. The main items discussed generally followed the attached KWA Discussion/Questions that were provided to City prior to the meeting. A summary of the key points discussed are provided below.

The questions submitted are repeated in the Discussion Items for easy reference. A summary of the action items generated from the meeting follow the Discussion Items.

### DISCUSSION ITEMS

1. Question/Discussion Item: Is the maximum day demand of 18 MGD for Flint the maximum day demand (MDD) throughout the 25 year planning period? If not, what is the 25 year projected MDD?

*KWA would supply up to 18 MGD. 18 MGD has been assumed as the maximum day demand and 12 MGD is assumed as the average day demand throughout the 25 year planning period.*

2. Question/Discussion Item: Copy of the intake contract documents and engineer's estimate.

The intake contract documents are approximately 90% complete and are not available for distribution. However, the updated Appendix 20, dated October 4, 2012 includes the most recent cost estimate of the intake based on the current design in process.

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

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3. Question/Discussion Item: Documentation of the Flint WTP improvements required and cost estimate.

*The costs are approximately \$7M as presented in the September 2009 Preliminary Engineering Report. However, this estimate has been updated. Some processes have been eliminated. John O'Brien will provide the updated costs and the description of the planned improvements to the plant.*

4. Question/Discussion Item: Confirm Flint's allocated percentage of the KWA capital improvements (30%?).

*Yes, the allocation is based on 18 MGD/60 MGD total capacity.*

5. Question/Discussion Item: Copy of the proposed KWA operating agreement for Flint.

*John O'Brien will provide the operating agreement as well as the Capacity Contract and Articles of Incorporation.*

6. Question/Discussion Item: What is the annual operating agreement adjustment projected for the 25 year planning period?

*This information is provided in Appendix 14, Table 14.2 of the September 2009 Preliminary Engineering Report. Operating cost based on Table 1. Used 12 MGD as average day demand (ADD). Assumed 5% as the annual increase in operating costs. John O'Brien indicated that these operating costs were based on Genesee County's operating costs. John O'Brien will provide the last 10 years of audited financial statements for the water fund.*

*To assess operating and maintenance costs for the Flint WTP, Duffy will provide multiple years of financial statements for the water fund. Duffy did not believe they had 10 years, but they will provide what they have.*

*Regarding operation and maintenance costs, Flint believes that these costs will increase by 2/3 of what they are now.*

7. Question/Discussion Item: Need the route of the pipelines and the locations of the facilities proposed. Purpose is to identify constraints that impact costs (i.e., utilities, environmental (e.g. wetlands), easements, etc.).

*KWA will not release the route due to concerns regarding speculation of land and easements. John O'Brien did indicate that the Lake Huron pump station would be at Fisher and M-25. The intermediate pump station site is near a location of the Lapeer/Sanilac/St. Clair border; where all three meet.*

8. Question/Discussion Item: KWA's initial charge to Flint is based on a 12 MGD average day demand. What is the basis of this number? Are there population projections and water use figures available that were used to determine the Flint demand for the 25 year planning period?

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*This was answered in Question No. 1 above.*

9. Question/Discussion Item: Is there a transition plan and cost during construction of the KWA system identified?

*Flint is looking for an agreement with DWSD for back-up supply from the 72-inch main at the Genesee border.*

10. Question/Discussion Item: The October 4, 2012 Preliminary Engineering Report Update states: "no backup power is planned for the pumps" (LHPS) and "No backup power is planned for pumping" (IPS). In case of power loss, how would Flint supply its customers?

*Flint indicated that they have adequate storage to supply the system for 6 to 7 days. Flint has 55 MG of storage and Genesee County has 65 MG for 2.5 days.*

11. Question/Discussion Item: The latest plan shows only a 5 million gallon ground reservoir is planned for balancing between LHPS and IPS. How is redundancy maintained?

*In cases of emergency, Flint indicated that the back-up for the KWA system will be the same as it is now with DWSD; they will use the Flint River as the source water. Flint currently operates their plant four times a year.*

*When questioned as to whether the WTP will be able to treat both lake water from the KWA system and river water Flint indicated that once the improvements identified in the September 2009 Preliminary Engineering Report are completed they will be able to accomplish both treatment processes. Flint will provide a schematic of the treatment trains at the WTP and a copy of the Flint transmission system.*

*Genesee County indicated that additional redundancy would also be provided from the new Genesee County WTP.*

*Regarding hydraulic transients; Genesee County indicated that a model analysis has not been included, but capital costs for mitigating transients have been included.*

12. Question/Discussion Item: Related to the construction cost:

- a. Does it include an additional traffic lane since the construction will occupy half the right of way? *Not required, all roads are county roads; however, there are a few State road crossings.*
- b. Does it include costs/fees for permit requirements such as inspection cost by the jurisdictional authorities? As a point of reference, the permit fee costs for the Flint Transmission System came out to be \$5.8 million. *Not required; all of the counties have waived any fees.*
- c. Does the cost of the steel pipe segments include corrosion protection measures such as

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anode stations and related O&M? Yes; however, the KWA has not settled on using steel pipe. PCCP pipe may be used. Steel shown in estimate because it is highest in cost and therefore the pricing is conservative.

d. SCADA monitoring stations require power. Is the cost of bring power to the SCADA stations included? Again, as a point of reference for the Flint Transmission System we estimated \$800,000 for power to SCADA and valve operators. Yes, Genesee County did emphasize that the SCADA system will be simple and straightforward because a lot of controls are not required.

e. Other items discussed at the meeting included:

- The 2009 plant improvement cost is still good; however, there will be some reduction, such as a sulfuric chloride feed system that was eliminated. Plant capacity now is 36MGD, but will be 18 MGD.
- The KWA Lake Huron Pumping Station (LHPS) is now only high lift pump station.
- Genesee County will provide the distance of the intake pipe from the crib to the LHPS.
- The intake project is almost ready to bid; waiting for the COE permit.
- Genesee County is estimating the construction for the pipe lines and pump stations will begin July 2013.
- The route has been flown for survey.
- Genesee County is estimating construction will be complete and the project will be placed in service by Jan 2016.
- Genesee County to provide a list of assumptions that the \$272 million cost estimate is based on since the route is now known.

13. The Flint River is identified as a backup: At what capacity? MDD or emergency supply?

*The Flint River would serve as a back up supply.*

14. Where did the 40 years come from (Flint hostage to Detroit)? DWSD's new contracts are 30 years with openers to revise terms of supply (volume and pressure) after the first two years, then three years, and then in five year increments thereafter.

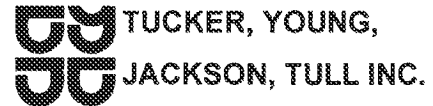
*The 40 years was stated in error. The reference was to DWSD's requirement to sign a 30 year contract.*

*After 40 years Flint will own 30% of the project and can sell their share of ownership if they want. Conversely, with DWSD, they continue to pay for the capital projects but have no ownership. Flint believes they will know what they will be charged for the next 25 years versus DWSD that can't commit to a fixed escalation.*

| Action Items for Follow-up  |               |                  |
|---|---------------|------------------|
| Items:  | Assigned To:  | Date to Complete |
| 1. Updated Costs for the Flint WTP improvements and a description of the improvements.                          | John O'Brien  | 11/21/12         |
| 2. KWA Operating Agreement, Capacity Contract and Articles of Incorporation.                                    | John O'Brien  | 11/20/12         |
| 3. Provide the last 10 years of audited financial statements for the Genesee water fund.                        | John O'Brien  | 11/20/12         |
| 4. Provide multiple years of financial statements for the City of Flint water fund.                             | Duffy Johnson | 11/26/12         |
| 5. Provide schematic of the Flint WTP and a map of the Flint transmission system.                               | Brent Wright  | 11/26/12         |
| 6. Provide the length of the intake pipe from the crib to the pump station.                                     | John O'Brien  | 11/20/12         |
| 7. Provide a list of assumptions that the \$272 million cost estimate is based on since the route is now known. | John O'Brien  | 11/26/12         |

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.





CONSULTING ENGINEERS-PLANNERS  
565 E. Larned Suite 300  
Detroit, Michigan 48226  
(313)963-0612 FAX (313)963-2156

**Indefinite-scope, Indefinite-delivery Contract Number 00383  
2012 Professional General Architectural/Engineering Services**

**CITY OF FLINT WATER SUPPLY ASSESSMENT**

KWA Discussion/Questions for the November 20, 2012 Meeting

1. Is the maximum day demand of 18 MGD for Flint the maximum day demand (MDD) throughout the 25 year planning period? If not, what is the 25 year projected MDD?
2. Copy of the intake contract documents and engineer's estimate.
3. Documentation of the Flint WTP improvements required and cost estimate.
4. Confirm Flint's allocated percentage of the KWA capital improvements (30%).
5. Copy of the proposed KWA operating agreement for Flint.
6. What is the annual operating agreement adjustment projected for the 25 year planning period?
7. Need the route of the pipelines and the locations of the facilities proposed. Purpose is to identify constraints that impact costs (i.e., utilities, environmental (e.g. wetlands), easements, etc.).
8. KWA's initial charge to Flint is based on a 12 MGD maximum day demand. What is the basis of this number? Are there population projections and water use figures available that were used to determine the Flint demand for the 25 year planning period?
9. Is there a transition plan and cost during construction of the KWA system identified?
10. The October 4, 2012 Preliminary Engineering Report Update states: "no backup power is planned for the pumps" (LHPS) and "No backup power is planned for pumping" (IPS). In case of power loss, how would Flint supply its customers?
11. The latest plan shows only a 5 million gallon ground reservoir is planned for balancing between LHPS and IPS. How is redundancy maintained?
12. Related to the construction cost:
  - a. Does it include an additional traffic lane since the construction will occupy half the right of way?
  - b. Does it include costs/fees for permit requirements such as inspection cost by the jurisdictional authorities? As a point of reference, the permit fee costs for the Flint Transmission System came out to be \$5.8 million.

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

- 
- c. Does the cost of the steel pipe segments include corrosion protection measures such as anode stations and related O&M?
  - d. SCADA monitoring stations require power. Is the cost of bring power to the SCADA stations included? Again, as a point of reference the for the Flint Transmission System we estimated \$800,000 for power to SCADA and valve operators.
13. The Flint River is identified as a backup: At what capacity? MDD or emergency supply?
14. Where did the 40 years come from (Flint hostage to Detroit)? DWSD's new contracts are 30 years with openers to revise terms of supply (volume and pressure) after the first two years, then three years, and then in five year increments thereafter.

STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

State of Michigan, Department of Treasury

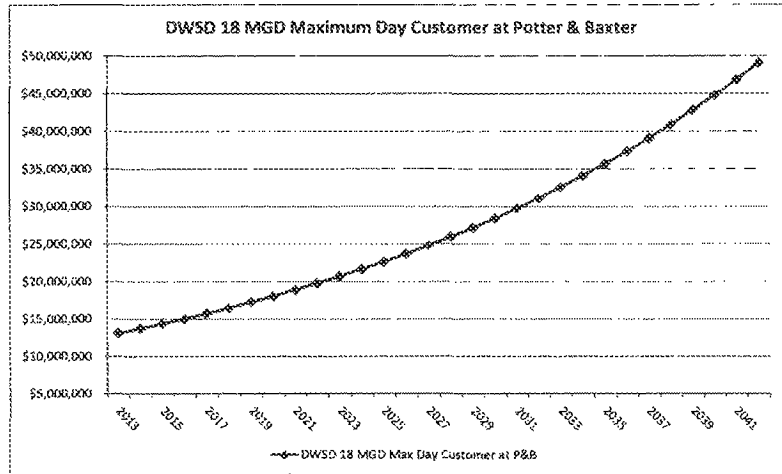
**Appendix B: Cost Worksheets**

DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract at Potter & Baxter

| Capacity                  | Flint ADD:           | 0.60 MGD      | 81 MCF/Day            | 1  | 2013 | Flint WTP O&M  | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------------------------|----------------------|---------------|-----------------------|----|------|----------------|----------------|----------------------|---------------------|---------------|
|                           | DWSD ADD:            | 12 MGD        | 1,604 MCF/Day         | 2  | 2014 | \$ 3,538,214   | \$ 9,585,642   | -                    | -                   | \$ 13,123,856 |
|                           |                      |               |                       | 3  | 2015 | \$ 3,697,768   | \$ 10,096,167  | -                    | -                   | \$ 13,793,935 |
|                           |                      |               |                       | 4  | 2016 | \$ 3,864,556   | \$ 10,507,867  | -                    | -                   | \$ 14,372,425 |
| Annual Volume             | Flint:               | 29,412 MCF    |                       | 5  | 2017 | \$ 4,038,850   | \$ 11,001,736  | -                    | -                   | \$ 15,040,586 |
|                           | DWSD:                | 585,561 MCF   |                       | 6  | 2018 | \$ 4,221,002   | \$ 11,518,818  | -                    | -                   | \$ 15,739,820 |
|                           |                      |               |                       | 7  | 2019 | \$ 4,411,369   | \$ 12,060,203  | -                    | -                   | \$ 16,471,571 |
| 2013 Cost of Supply       |                      |               |                       | 8  | 2020 | \$ 4,610,322   | \$ 12,627,032  | -                    | -                   | \$ 17,237,354 |
|                           | Flint WTP O&M:       | 120.30 /MCF   | \$ 3,538,214 /Yr      | 9  | 2021 | \$ 4,818,247   | \$ 13,220,503  | -                    | -                   | \$ 18,038,750 |
|                           | DWSD:                | \$ 16.37 /MCF | \$ 9,585,642 /Yr      | 10 | 2022 | \$ 5,035,550   | \$ 13,841,866  | -                    | -                   | \$ 18,877,416 |
|                           |                      |               |                       | 11 | 2023 | \$ 5,262,653   | \$ 14,492,434  | -                    | -                   | \$ 19,755,087 |
| Escalation/Inflation Rate |                      |               |                       | 12 | 2024 | \$ 5,499,999   | \$ 15,173,578  | -                    | -                   | \$ 20,673,577 |
|                           | Flint:               | 4.51% /Yr     |                       | 13 | 2025 | \$ 5,748,049   | \$ 15,886,736  | -                    | -                   | \$ 21,634,785 |
|                           | DWSD:                | 4.7% /Yr      |                       | 14 | 2026 | \$ 6,007,286   | \$ 16,633,413  | -                    | -                   | \$ 22,640,699 |
|                           |                      |               |                       | 15 | 2027 | \$ 6,278,215   | \$ 17,415,183  | -                    | -                   | \$ 23,693,398 |
| Capital Expenditure       |                      |               |                       | 16 | 2028 | \$ 6,561,362   | \$ 18,233,697  | -                    | -                   | \$ 24,795,059 |
|                           | Amount:              | \$ -          |                       | 17 | 2029 | \$ 6,857,279   | \$ 19,090,681  | -                    | -                   | \$ 25,947,960 |
|                           | Reserve:             | \$ -          | 0% Reserve Rate 0.00% | 18 | 2030 | \$ 7,166,543   | \$ 19,987,943  | -                    | -                   | \$ 27,154,486 |
|                           | Amount plus Reserve: | \$ -          |                       | 19 | 2031 | \$ 7,489,754   | \$ 20,927,376  | -                    | -                   | \$ 28,417,130 |
|                           | Revenue Bond Rate:   | 5%            |                       | 20 | 2032 | \$ 7,827,542   | \$ 21,910,963  | -                    | -                   | \$ 29,738,505 |
|                           | Number of Years:     | 25            |                       | 21 | 2033 | \$ 8,180,564   | \$ 22,940,778  | -                    | -                   | \$ 31,121,342 |
|                           | Annual Cost:         | \$0           |                       | 22 | 2034 | \$ 8,549,507   | \$ 24,018,995  | -                    | -                   | \$ 32,568,502 |
|                           |                      |               |                       | 23 | 2035 | \$ 8,935,090   | \$ 25,147,887  | -                    | -                   | \$ 34,082,977 |
|                           |                      |               |                       | 24 | 2036 | \$ 9,338,063   | \$ 26,329,838  | -                    | -                   | \$ 35,667,901 |
|                           |                      |               |                       | 25 | 2037 | \$ 9,759,209   | \$ 27,567,341  | -                    | -                   | \$ 37,326,550 |
|                           |                      |               |                       |    | 2038 | \$ 10,199,350  | \$ 28,863,006  | -                    | -                   | \$ 39,062,355 |
|                           |                      |               |                       |    | 2039 | \$ 10,659,340  | \$ 30,219,557  | -                    | -                   | \$ 40,878,907 |
|                           |                      |               |                       |    | 2040 | \$ 11,140,076  | \$ 31,639,886  | -                    | -                   | \$ 42,779,963 |
|                           |                      |               |                       |    | 2041 | \$ 11,642,494  | \$ 33,126,961  | -                    | -                   | \$ 44,769,455 |
|                           |                      |               |                       |    | 2042 | \$ 12,167,570  | \$ 34,693,928  | -                    | -                   | \$ 46,861,499 |
|                           |                      |               |                       |    |      | \$ 12,716,328  | \$ 36,314,073  | -                    | -                   | \$ 49,030,401 |
|                           |                      |               |                       |    |      | \$ 216,222,171 |                |                      |                     |               |

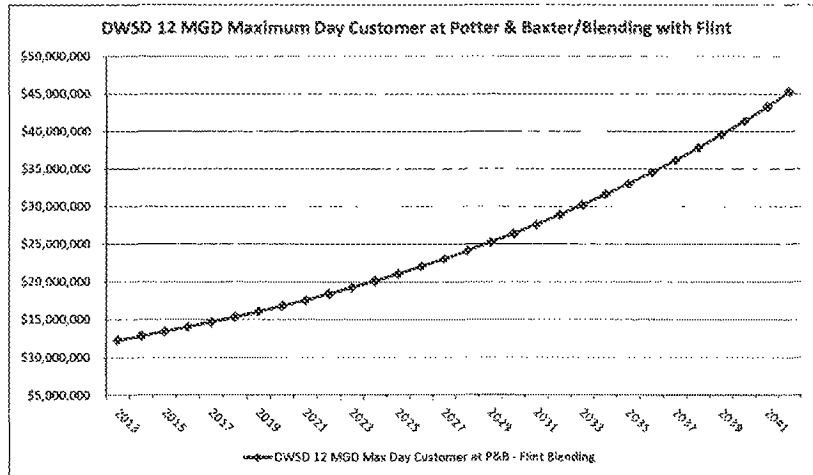
25 Yrs Cumulative  
\$ 566,916,044

30 Yrs Cumulative  
\$ 821,226,268



DWSD Worksheet : 12 MGD Maximum Day Customer with Model Contract at Potter & Baxter/Blending with Flint

| Capacity                  | Flint ADD:           | 4 MGD         | 535 MCF/Day            | 1  | Year | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------------------------|----------------------|---------------|------------------------|----|------|---------------|----------------|----------------------|---------------------|---------------|
|                           | DWSD ADD:            | 8 MGD         | 1,070 MCF/Day          | 2  | 2013 | \$ 5,895,097  | 6,367,005      | -                    | -                   | \$ 12,262,103 |
|                           |                      |               |                        | 3  | 2014 | \$ 6,160,966  | 6,666,255      | -                    | -                   | \$ 12,827,221 |
|                           |                      |               |                        | 4  | 2015 | \$ 6,438,826  | 6,979,569      | -                    | -                   | \$ 13,418,395 |
| Annual Volume             | Flint:               | 195,187 MCF   | 195187.1658            | 5  | 2016 | \$ 6,729,217  | 7,307,608      | -                    | -                   | \$ 14,036,825 |
|                           | DWSD:                | 390,374 MCF   |                        | 6  | 2017 | \$ 7,032,705  | 7,651,066      | -                    | -                   | \$ 14,683,771 |
|                           |                      |               | 5895097.471            | 7  | 2018 | \$ 7,349,880  | 8,010,666      | -                    | -                   | \$ 15,360,546 |
| 2013 Cost of Supply       |                      |               |                        | 8  | 2019 | \$ 7,681,359  | 8,387,167      | -                    | -                   | \$ 16,068,527 |
|                           | Flint WTP O&M:       | \$ 30.20 /MCF | \$ 5,895,097 /Yr       | 9  | 2020 | \$ 8,027,789  | 8,781,364      | -                    | -                   | \$ 16,809,153 |
|                           | DWSD:                | \$ 15.31 /MCF | \$ 6,367,005 /Yr       | 10 | 2021 | \$ 8,389,842  | 9,194,088      | -                    | -                   | \$ 17,583,930 |
|                           |                      |               |                        | 11 | 2022 | \$ 8,768,224  | 9,626,210      | -                    | -                   | \$ 18,394,434 |
| Escalation/Inflation Rate |                      |               |                        | 12 | 2023 | \$ 9,163,671  | 10,078,642     | -                    | -                   | \$ 19,242,313 |
|                           | Flint:               | 4.51% /Yr     |                        | 13 | 2024 | \$ 9,576,952  | 10,552,338     | -                    | -                   | \$ 20,129,291 |
|                           | DWSD:                | 4.7% /Yr      |                        | 14 | 2025 | \$ 10,008,873 | 11,048,298     | -                    | -                   | \$ 21,057,171 |
|                           |                      |               |                        | 15 | 2026 | \$ 10,460,273 | 11,567,568     | -                    | -                   | \$ 22,027,841 |
|                           |                      |               |                        | 16 | 2027 | \$ 10,932,093 | 12,111,244     | -                    | -                   | \$ 23,043,275 |
| Capital Expenditure       |                      |               |                        | 17 | 2028 | \$ 11,425,066 | 12,680,479     | -                    | -                   | \$ 24,105,538 |
|                           | Amount:              | \$ -          |                        | 18 | 2029 | \$ 11,940,336 | 13,276,455     | -                    | -                   | \$ 25,216,791 |
|                           | Reserve:             | \$ -          | 0% Reserve Rate: 0.00% | 19 | 2030 | \$ 12,478,845 | 13,900,448     | -                    | -                   | \$ 26,379,294 |
|                           | Amount plus Reserve: | \$ -          |                        | 20 | 2031 | \$ 13,041,641 | 14,553,769     | -                    | -                   | \$ 27,595,410 |
|                           | Revenue Bond Rate:   | 5%            |                        | 21 | 2032 | \$ 13,629,819 | 15,237,796     | -                    | -                   | \$ 28,867,616 |
|                           | Number of Years:     | 25            |                        | 22 | 2033 | \$ 14,244,524 | 15,953,973     | -                    | -                   | \$ 30,198,497 |
|                           | Annual Cost:         | \$0           |                        | 23 | 2034 | \$ 14,886,952 | 16,703,810     | -                    | -                   | \$ 31,590,762 |
|                           |                      |               |                        | 24 | 2035 | \$ 15,558,354 | 17,488,889     | -                    | -                   | \$ 33,047,242 |
|                           |                      |               |                        | 25 | 2036 | \$ 16,260,035 | 18,310,866     | -                    | -                   | \$ 34,570,902 |
|                           |                      |               |                        |    | 2037 | \$ 16,993,363 | 19,171,477     | -                    | -                   | \$ 36,164,840 |
|                           |                      |               |                        |    | 2038 | \$ 17,759,764 | 20,072,537     | -                    | -                   | \$ 37,832,300 |
|                           |                      |               |                        |    | 2039 | \$ 18,560,729 | 21,015,946     | -                    | -                   | \$ 39,576,675 |
|                           |                      |               |                        |    | 2040 | \$ 19,397,818 | 22,003,695     | -                    | -                   | \$ 41,401,513 |
|                           |                      |               |                        |    | 2041 | \$ 20,272,650 | 23,037,869     | -                    | -                   | \$ 43,310,528 |
|                           |                      |               |                        |    | 2042 | \$ 21,186,956 | 24,120,649     | -                    | -                   | \$ 45,307,605 |



25 Yrs Cumulative  
\$ 554,681,686

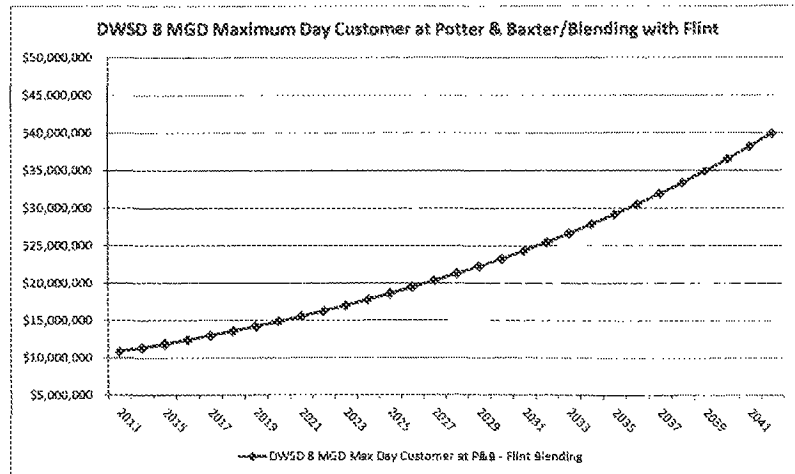
30 Yrs Cumulative  
\$ 762,110,308

DWSD Worksheet : 8 MGD Maximum Day Customer with Model Contract at Potter & Baxter/Blending with Flint

| Capacity                  | Flint ADD:           | 4 MGD         | 535 MCF/Day            | 1  | Year | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------------------------|----------------------|---------------|------------------------|----|------|---------------|----------------|----------------------|---------------------|---------------|
|                           | DWSD ADD:            | 8 MGD         | 1,970 MCF/Day          | 2  | 2013 | \$ 5,895,097  | 4,949,947      | -                    | -                   | \$ 10,845,044 |
|                           |                      |               |                        | 3  | 2014 | \$ 6,160,966  | 5,182,594      | -                    | -                   | \$ 11,343,560 |
|                           |                      |               |                        | 4  | 2015 | \$ 6,438,826  | 5,426,176      | -                    | -                   | \$ 11,865,002 |
| Annual Volume             | Flint:               | 395,187 MCF   |                        | 5  | 2016 | \$ 6,729,237  | 5,681,206      | -                    | -                   | \$ 12,410,423 |
|                           | DWSD:                | 390,374 MCF   |                        | 6  | 2017 | \$ 7,032,705  | 5,948,223      | -                    | -                   | \$ 12,980,928 |
|                           |                      |               |                        | 7  | 2018 | \$ 7,349,880  | 6,227,789      | -                    | -                   | \$ 13,577,669 |
|                           |                      |               |                        | 8  | 2019 | \$ 7,681,359  | 6,520,495      | -                    | -                   | \$ 14,201,855 |
| 2013 Cost of Supply       |                      |               |                        | 9  | 2020 | \$ 8,027,789  | 6,826,959      | -                    | -                   | \$ 14,854,747 |
|                           | Flint WTP O&M:       | \$ 30.20 /MCF | \$ 5,895,097 /Yr       | 10 | 2021 | \$ 8,389,842  | 7,147,826      | -                    | -                   | \$ 15,537,668 |
|                           | DWSD:                | \$ 12.68 /MCF | \$ 4,949,947 /Yr       | 11 | 2022 | \$ 8,768,224  | 7,483,774      | -                    | -                   | \$ 16,251,997 |
|                           |                      |               |                        | 12 | 2023 | \$ 9,163,671  | 7,835,511      | -                    | -                   | \$ 16,999,182 |
| Escalation/Inflation Rate |                      |               |                        | 13 | 2024 | \$ 9,576,952  | 8,203,780      | -                    | -                   | \$ 17,780,732 |
|                           | Flint:               | 4.51% /Yr     |                        | 14 | 2025 | \$ 10,008,873 | 8,589,358      | -                    | -                   | \$ 18,598,230 |
|                           | DWSD:                | 4.7% /Yr      |                        | 15 | 2026 | \$ 10,460,273 | 8,993,057      | -                    | -                   | \$ 19,453,330 |
|                           |                      |               |                        | 16 | 2027 | \$ 10,932,031 | 9,415,731      | -                    | -                   | \$ 20,347,762 |
| Capital Expenditure       |                      |               |                        | 17 | 2028 | \$ 11,425,066 | 9,858,271      | -                    | -                   | \$ 21,283,336 |
|                           | Amount:              | \$ -          |                        | 18 | 2029 | \$ 11,940,336 | 10,321,609     | -                    | -                   | \$ 22,261,945 |
|                           | Reserve:             | \$ -          | 0% Reserve Rate: 0.00% | 19 | 2030 | \$ 12,478,845 | 10,806,725     | -                    | -                   | \$ 23,285,570 |
|                           | Amount plus Reserve: | \$ -          |                        | 20 | 2031 | \$ 13,041,641 | 11,314,641     | -                    | -                   | \$ 24,356,282 |
|                           | Revenue Bond Rate:   | 5%            |                        | 21 | 2032 | \$ 13,629,819 | 11,846,429     | -                    | -                   | \$ 25,476,248 |
|                           | Number of Years:     | 25            |                        | 22 | 2033 | \$ 14,244,524 | 12,403,211     | -                    | -                   | \$ 26,647,735 |
|                           | Annual Cost:         | \$0           |                        | 23 | 2034 | \$ 14,886,952 | 12,985,162     | -                    | -                   | \$ 27,873,114 |
|                           |                      |               |                        | 24 | 2035 | \$ 15,558,354 | 13,596,512     | -                    | -                   | \$ 29,154,866 |
|                           |                      |               |                        | 25 | 2036 | \$ 16,260,035 | 14,235,548     | -                    | -                   | \$ 30,495,583 |
|                           |                      |               |                        |    | 2037 | \$ 16,993,363 | 14,904,619     | -                    | -                   | \$ 31,897,982 |
|                           |                      |               |                        |    | 2038 | \$ 17,759,764 | 15,605,136     | -                    | -                   | \$ 33,364,900 |
|                           |                      |               |                        |    | 2039 | \$ 18,560,729 | 16,338,577     | -                    | -                   | \$ 34,899,306 |
|                           |                      |               |                        |    | 2040 | \$ 19,397,818 | 17,106,490     | -                    | -                   | \$ 36,504,308 |
|                           |                      |               |                        |    | 2041 | \$ 20,272,660 | 17,910,495     | -                    | -                   | \$ 38,183,155 |
|                           |                      |               |                        |    | 2042 | \$ 21,186,956 | 18,752,288     | -                    | -                   | \$ 39,939,245 |

25 Yrs Cumulative  
\$ 689,780,792

30 Yrs Cumulative  
\$ 671,671,705

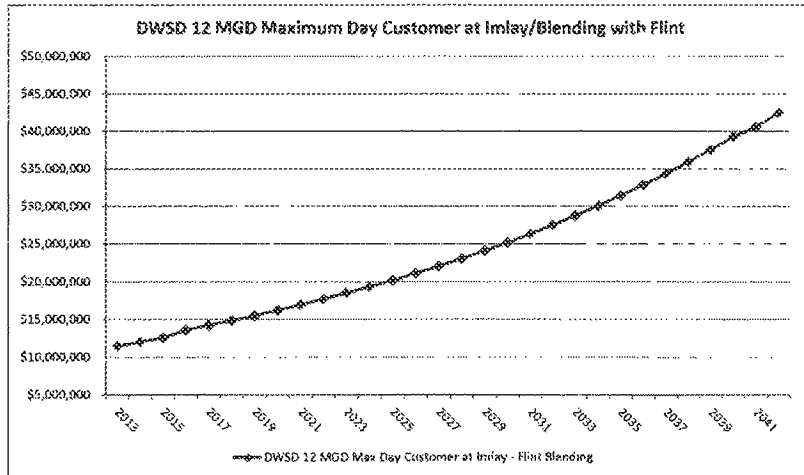


**DWSD Worksheet : 12 MGD Maximum Day Customer with Model Contract at Imlay/Blending with Flint**

|   |                |               |                                   |      | Year          | Flint WTP     | Water      | Revenue | Interest      |               |
|---|----------------|---------------|-----------------------------------|------|---------------|---------------|------------|---------|---------------|---------------|
| Capacity  |                |               |                                   |      |               | O&M           | Purchase   | Bond    | on            | TOTAL         |
|   |                |               |                                   |      |               |               |            | Payment | Reserve       |               |
|   | Flint ADD:     | 4 MGD         | 535 MCF/Day                       | 1    | 2013          | \$ 5,895,097  | 5,613,583  |         | 19,500        | \$ 11,489,180 |
|   | DWSD ADD:      | 8 MGD         | 1,070 MCF/Day                     | 2    | 2014          | \$ 5,160,966  | 5,877,421  |         | 19,500        | \$ 12,018,888 |
|   |                |               |                                   | 3    | 2015          | \$ 6,438,826  | 6,153,660  |         | 19,500        | \$ 12,572,986 |
| Annual Volume   |                |               |                                   | 4    | 2016          | \$ 6,729,217  | 6,442,882  | 462,610 | 19,500        | \$ 13,615,209 |
|   | Flint:         | 195,187 MCF   |                                   | 5    | 2017          | \$ 7,032,705  | 6,745,698  | 462,610 | 19,500        | \$ 14,221,512 |
|   | DWSD:          | 390,374 MCF   |                                   | 6    | 2018          | \$ 7,349,880  | 7,062,745  | 462,610 | 19,500        | \$ 14,855,735 |
| 2013 Cost of Supply   |                |               |                                   | 7    | 2019          | \$ 7,681,359  | 7,394,694  | 462,610 | 19,500        | \$ 15,518,164 |
|   |                |               |                                   | 8    | 2020          | \$ 8,027,789  | 7,742,245  | 462,610 | 19,500        | \$ 16,213,144 |
|   | Flint WTP O&M: | \$ 30.20 /MCF | \$ 5,895,097 /Yr                  | 9    | 2021          | \$ 8,389,342  | 8,106,131  | 462,610 | 19,500        | \$ 16,939,082 |
|   | DWSD:          | \$ 14.38 /MCF | \$ 5,613,583 /Yr                  | 10   | 2022          | \$ 8,768,224  | 8,487,119  | 462,610 | 19,500        | \$ 17,698,452 |
| Escalation/Inflation Rate                                     |                |               |                                   | 11   | 2023          | \$ 9,163,671  | 8,886,013  | 462,610 | 19,500        | \$ 18,492,794 |
|   |                |               |                                   | 12   | 2024          | \$ 9,576,952  | 9,303,656  | 462,610 | 19,500        | \$ 19,323,738 |
|   | Flint:         | 4.51% /Yr     |                                   | 13   | 2025          | \$ 10,008,873 | 9,740,928  | 462,610 | 19,500        | \$ 20,192,930 |
|   | DWSD:          | 4.7% /Yr      |                                   | 14   | 2026          | \$ 10,460,279 | 10,188,751 | 462,610 | 19,500        | \$ 21,102,134 |
| Capital Expenditure   |                |               |                                   | 15   | 2027          | \$ 10,932,031 | 10,678,093 | 462,610 | 19,500        | \$ 22,053,134 |
|   |                |               |                                   | 16   | 2028          | \$ 11,425,066 | 11,179,963 | 462,610 | 19,500        | \$ 23,048,139 |
|   | Capital:       | \$ 4,700,000  |                                   | 17   | 2029          | \$ 11,940,336 | 11,705,421 | 462,610 | 19,500        | \$ 24,088,867 |
| Bond Issuance (3% of Total):                                  | 185,000        | Check:        | 3.0%                              | 18   | 2030          | \$ 12,478,845 | 12,255,576 | 462,610 | 19,500        | \$ 25,177,531 |
| 3 Years of Capitalized Interest:                              | 975,000        | Check:        | 5.0% /Yr (Bond Interest on Total) | 19   | 2031          | \$ 13,041,641 | 12,831,588 | 462,610 | 19,500        | \$ 26,316,339 |
| Reserve (10% of Total):                                       | 650,000        | Check:        | 10.0%                             | 20   | 2032          | \$ 13,629,819 | 13,434,673 | 462,610 | 19,500        | \$ 27,507,602 |
| Total:  | \$ 6,520,000   |               |                                   | 21   | 2033          | \$ 14,244,524 | 14,066,102 | 462,610 | 19,500        | \$ 28,753,736 |
| Revenue Bond Rate:  | 5%             |               |                                   | 22   | 2034          | \$ 14,886,952 | 14,727,209 | 462,610 | 19,500        | \$ 30,057,271 |
| Number of Years:  | 25             |               |                                   | 23   | 2035          | \$ 15,558,354 | 15,419,388 | 462,610 | 19,500        | \$ 31,420,852 |
| Annual Cost:  | \$462,610      |               |                                   | 24   | 2036          | \$ 16,260,035 | 16,144,093 | 462,610 | 19,500        | \$ 32,847,245 |
| Interest on Reserve:  | 3%             |               |                                   | 25   | 2037          | \$ 16,993,363 | 16,902,872 | 462,610 | 19,500        | \$ 34,339,345 |
| DWSD 12 MGD Maximum Day Customer at Imley/Blending with Flint |                |               |                                   | 2038 | \$ 17,759,764 | 17,687,307    | 462,610    | 19,500  | \$ 35,900,181 |               |
|   |                |               |                                   | 2039 | \$ 18,560,729 | 18,529,680    | 462,610    | 19,500  | \$ 37,532,919 |               |
|   |                |               |                                   | 2040 | \$ 19,397,818 | 19,399,947    | 462,610    | 19,500  | \$ 39,240,875 |               |
|   |                |               |                                   | 2041 | \$ 20,272,660 | 20,311,745    |            |         | \$ 40,584,404 |               |
|   |                |               |                                   | 2042 | \$ 21,186,956 | 21,266,397    |            |         | \$ 42,453,353 |               |

**25 Yrs Cumulative**  
\$ 529,865,071

**30 Yrs Cumulative**  
\$ 725,576,893

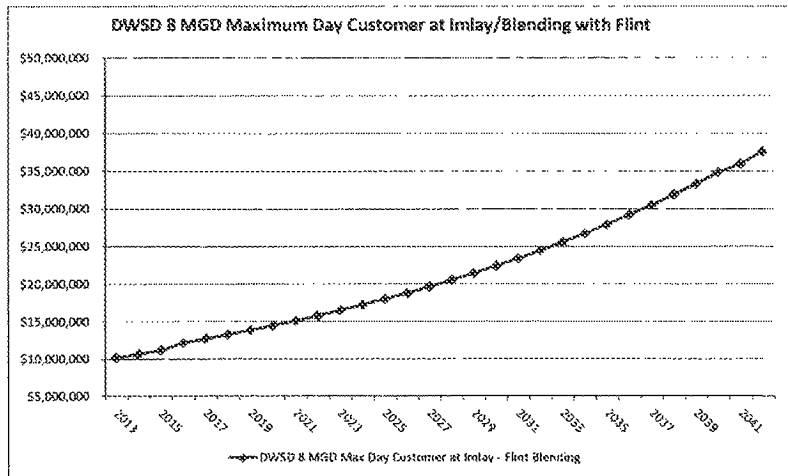


**DWSD Worksheet : 8 MGD Maximum Day Customer with Model Contract at Imlay/Blending with Flint**

|                                  |                                  |              |        | Flint WTP                         |         | Water | Revenue |               | Interest on  |         | TOTAL         |
|----------------------------------|----------------------------------|--------------|--------|-----------------------------------|---------|-------|---------|---------------|--------------|---------|---------------|
| Capacity                         | Flint ADD:                       | 4            | MGD    | 535                               | MCF/Day | Year  | O&M     | Purchase      | Bond Payment | Reserve |               |
|                                  | DWSD ADD:                        | 8            | MGD    | 1,070                             | MCF/Day |       |         |               |              |         |               |
| <b>Annual Volume</b>             |                                  |              |        |                                   |         |       |         |               |              |         |               |
|                                  | Flint:                           | 195,187      | MCF    |                                   |         | 1     | 2013    | \$ 5,895,097  | 4,337,059    | 19,500  | \$ 10,212,656 |
|                                  | DWSD:                            | 390,374      | MCF    |                                   |         | 2     | 2014    | \$ 6,160,966  | 4,540,901    | 19,500  | \$ 10,682,367 |
| <b>2013 Cost of Supply</b>       |                                  |              |        |                                   |         |       |         |               |              |         |               |
|                                  | Flint WTP O&M:                   | \$ 30.20     | /MCF   | \$ 5,895,097                      | /Yr     | 3     | 2015    | \$ 6,438,826  | 4,754,323    | 19,500  | \$ 11,173,649 |
|                                  | DWSD:                            | \$ 11.11     | /MCF   | \$ 4,337,059                      | /Yr     | 4     | 2016    | \$ 6,729,217  | 4,977,776    | 462,610 | \$ 12,150,103 |
| <b>Escalation/Inflation Rate</b> |                                  |              |        |                                   |         |       |         |               |              |         |               |
|                                  | Flint:                           | 4.51%        | /Yr    |                                   |         | 5     | 2017    | \$ 7,032,706  | 5,211,732    | 462,610 | \$ 12,687,546 |
|                                  | DWSD:                            | 4.7%         | /Yr    |                                   |         | 6     | 2018    | \$ 7,349,880  | 5,456,683    | 462,610 | \$ 13,248,673 |
| <b>Capital Expenditure</b>       |                                  |              |        |                                   |         |       |         |               |              |         |               |
|                                  | Capital:                         | \$ 4,700,000 |        |                                   |         | 7     | 2019    | \$ 7,681,358  | 5,713,147    | 462,610 | \$ 13,837,616 |
|                                  | Bond Issuance (3% of Total):     | 195,000      | Check: | 3.0%                              |         | 8     | 2020    | \$ 8,027,789  | 5,981,665    | 462,610 | \$ 14,452,564 |
|                                  | 3 Years of Capitalized Interest: | 975,000      | Check: | 5.0% /Yr (Bond interest on Total) |         | 9     | 2021    | \$ 8,389,842  | 6,262,803    | 462,610 | \$ 15,095,795 |
|                                  | Reserve (10% of Total):          | 690,000      | Check: | 10.0%                             |         | 10    | 2022    | \$ 8,768,224  | 6,557,155    | 462,610 | \$ 15,768,489 |
|                                  | Total:                           | \$ 6,520,000 |        |                                   |         | 11    | 2023    | \$ 9,169,671  | 6,865,341    | 462,610 | \$ 16,472,322 |
|                                  | Revenue Bond Rate:               | 5%           |        |                                   |         | 12    | 2024    | \$ 9,576,952  | 7,188,012    | 462,610 | \$ 17,208,074 |
|                                  | Number of Years:                 | 25           |        |                                   |         | 13    | 2025    | \$ 10,008,873 | 7,525,849    | 462,610 | \$ 17,977,832 |
|                                  | Annual Cost:                     | \$462,610    |        |                                   |         | 14    | 2026    | \$ 10,460,273 | 7,879,564    | 462,610 | \$ 18,782,947 |
|                                  | Interest on Reserves:            | 3%           |        |                                   |         | 15    | 2027    | \$ 10,932,031 | 8,249,903    | 462,610 | \$ 19,625,044 |
|                                  |                                  |              |        |                                   |         | 16    | 2028    | \$ 11,425,066 | 8,637,649    | 462,610 | \$ 20,505,824 |
|                                  |                                  |              |        |                                   |         | 17    | 2029    | \$ 11,940,336 | 9,043,618    | 462,610 | \$ 21,427,064 |
|                                  |                                  |              |        |                                   |         | 18    | 2030    | \$ 12,478,845 | 9,468,668    | 462,610 | \$ 22,390,624 |
|                                  |                                  |              |        |                                   |         | 19    | 2031    | \$ 13,041,641 | 9,913,696    | 462,610 | \$ 23,398,447 |
|                                  |                                  |              |        |                                   |         | 20    | 2032    | \$ 13,629,819 | 10,379,639   | 462,610 | \$ 24,452,593 |
|                                  |                                  |              |        |                                   |         | 21    | 2033    | \$ 14,244,524 | 10,867,482   | 462,610 | \$ 25,555,117 |
|                                  |                                  |              |        |                                   |         | 22    | 2034    | \$ 14,886,852 | 11,378,254   | 462,610 | \$ 26,708,316 |
|                                  |                                  |              |        |                                   |         | 23    | 2035    | \$ 15,558,354 | 11,913,032   | 462,610 | \$ 27,914,496 |
|                                  |                                  |              |        |                                   |         | 24    | 2036    | \$ 16,260,035 | 12,472,945   | 462,610 | \$ 29,176,090 |
|                                  |                                  |              |        |                                   |         | 25    | 2037    | \$ 16,993,363 | 13,059,173   | 462,610 | \$ 30,489,846 |
|                                  |                                  |              |        |                                   |         |       | 2038    | \$ 17,759,764 | 13,672,954   | 462,610 | \$ 31,875,828 |
|                                  |                                  |              |        |                                   |         |       | 2039    | \$ 18,560,729 | 14,315,583   | 462,610 | \$ 33,319,822 |
|                                  |                                  |              |        |                                   |         |       | 2040    | \$ 19,397,818 | 14,988,415   | 462,610 | \$ 34,829,343 |
|                                  |                                  |              |        |                                   |         |       | 2041    | \$ 20,272,660 | 15,692,871   |         | \$ 35,965,530 |
|                                  |                                  |              |        |                                   |         |       | 2042    | \$ 21,186,956 | 16,430,436   |         | \$ 37,617,392 |

**25 Yrs Cumulative**  
\$ 493,063,801

**30 Yrs Cumulative**  
\$ 634,795,488





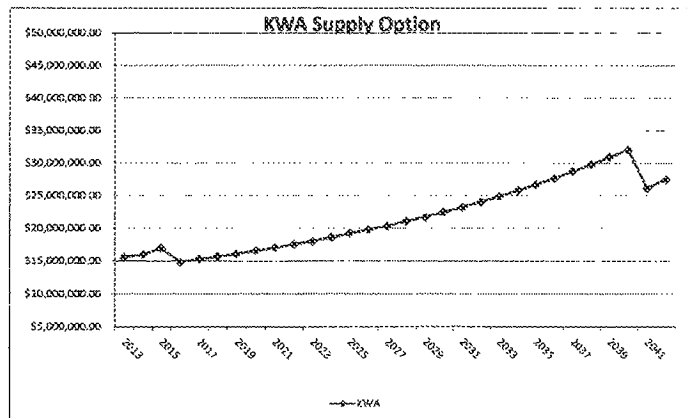
KWA Supply Option Worksheets

KWA 10/31/12 No Constraints

|    | Year | DWSD & Flint<br>WTP Costs | KWA Entry<br>Fee | KWA Debt<br>Service | Flint WTP<br>Debt Service | KWA<br>Operation<br>s | Flint WTP<br>Operations<br>with KWA | TOTAL         |
|----|------|---------------------------|------------------|---------------------|---------------------------|-----------------------|-------------------------------------|---------------|
| 1  | 2013 | \$ 14,413,858             | 1,162,800        |                     |                           |                       |                                     | \$ 15,576,658 |
| 2  | 2014 | \$ 15,355,125             | 581,400          |                     |                           |                       |                                     | \$ 15,936,525 |
| 3  | 2015 | \$ 16,365,534             | 581,400          |                     |                           |                       |                                     | \$ 16,946,934 |
| 4  | 2016 |                           |                  | 6,593,155           | 572,781                   | 678,859               | 6,843,344                           | \$ 14,888,149 |
| 5  | 2017 |                           |                  | 6,593,155           | 572,781                   | 922,811               | 7,185,511                           | \$ 15,274,260 |
| 6  | 2018 |                           |                  | 6,593,155           | 572,781                   | 968,953               | 7,544,787                           | \$ 15,679,876 |
| 7  | 2019 |                           |                  | 6,593,155           | 572,781                   | 1,017,401             | 7,922,026                           | \$ 16,305,363 |
| 8  | 2020 |                           |                  | 6,593,155           | 572,781                   | 1,068,271             | 8,318,127                           | \$ 16,952,334 |
| 9  | 2021 |                           |                  | 6,593,155           | 572,781                   | 1,121,684             | 8,734,084                           | \$ 17,021,654 |
| 10 | 2022 |                           |                  | 6,593,155           | 572,781                   | 1,177,769             | 9,170,735                           | \$ 17,514,440 |
| 11 | 2023 |                           |                  | 6,593,155           | 572,781                   | 1,236,657             | 9,629,272                           | \$ 18,093,865 |
| 12 | 2024 |                           |                  | 6,593,155           | 572,781                   | 1,298,490             | 10,110,736                          | \$ 18,675,362 |
| 13 | 2025 |                           |                  | 6,593,155           | 572,781                   | 1,363,418             | 10,616,273                          | \$ 19,345,623 |
| 14 | 2026 |                           |                  | 6,593,155           | 572,781                   | 1,431,585             | 11,147,066                          | \$ 19,744,607 |
| 15 | 2027 |                           |                  | 6,593,155           | 572,781                   | 1,503,164             | 11,704,841                          | \$ 20,373,541 |
| 16 | 2028 |                           |                  | 6,593,155           | 572,781                   | 1,578,322             | 12,289,663                          | \$ 21,033,921 |
| 17 | 2029 |                           |                  | 6,593,155           | 572,781                   | 1,657,235             | 12,904,146                          | \$ 21,727,320 |
| 18 | 2030 |                           |                  | 6,593,155           | 572,781                   | 1,740,101             | 13,549,353                          | \$ 22,455,390 |
| 19 | 2031 |                           |                  | 6,593,155           | 572,781                   | 1,827,106             | 14,226,821                          | \$ 23,218,861 |
| 20 | 2032 |                           |                  | 6,593,155           | 572,781                   | 1,918,461             | 14,938,162                          | \$ 24,022,559 |
| 21 | 2033 |                           |                  | 6,593,155           | 572,781                   | 2,014,384             | 15,685,070                          | \$ 24,865,390 |
| 22 | 2034 |                           |                  | 6,593,155           | 572,781                   | 2,115,103             | 16,469,523                          | \$ 25,750,362 |
| 23 | 2035 |                           |                  | 6,593,155           | 572,781                   | 2,220,858             | 17,292,789                          | \$ 26,679,584 |
| 24 | 2036 |                           |                  | 6,593,155           | 572,781                   | 2,331,901             | 18,157,479                          | \$ 27,655,266 |
| 25 | 2037 |                           |                  | 6,593,155           | 572,781                   | 2,448,496             | 19,065,300                          | \$ 28,679,733 |
|    | 2038 |                           |                  | 6,593,155           | 572,781                   | 2,570,921             | 20,018,565                          | \$ 29,755,423 |
|    | 2039 |                           |                  | 6,593,155           | 572,781                   | 2,699,467             | 21,019,494                          | \$ 30,884,897 |
|    | 2040 |                           |                  | 6,593,155           | 572,781                   | 2,834,440             | 22,070,468                          | \$ 32,070,845 |
|    | 2041 |                           |                  |                     |                           | 2,975,162             | 23,173,892                          | \$ 33,150,154 |
|    | 2042 |                           |                  |                     |                           | 3,124,970             | 24,332,691                          | \$ 34,457,662 |

25 Yrs Cumulative  
\$ 503,456,185

30 Yrs Cumulative  
\$ 649,773,166



# SWA Supply Option Worksheet 2000-1

Capital: First AGO: 12 MAGD 1,604 MCF/Day  
SWA AGO: 12 MAGD 1,604 MCF/Day

Annual Volume First: 205,561 AGO  
Second: 205,561 AGO

2026 Cost of Supply First WTP O&M: 13.00 /ACF \$ 7,012,115 /Y  
SWA: 1.50 /ACF \$ 675,240 /Y

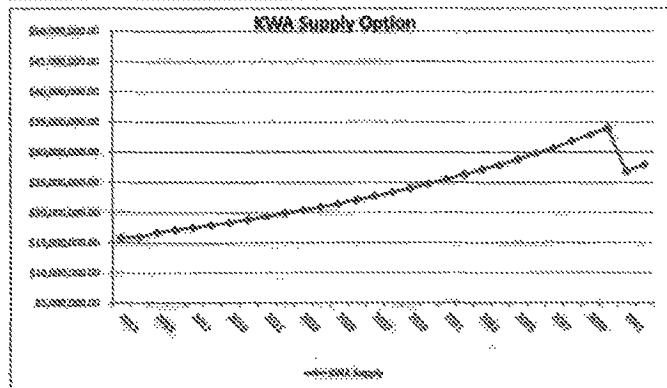
Generation/Injection Rate First: 4.20% /Y  
SWA: 5.00% /Y

Capital Expenditures Capital: \$ 275,435,200  
Bond Interest (2.25% of Total): \$ 6,081,561 Check: 2.25%  
5 Years of Capitalized Interest: \$6,998,660 Check: 5.25% /Y (Bond Interest on Total)  
Reserve (10% of Total): \$7,500,000 Check: 10.00%  
Total: \$ 295,915,321

SWA's Share (20%) \$ 59,183,064  
Revenue Bond Issue: 20  
Number of Years: 20  
Annual Cost: \$7,500,000  
Interest on Revenue: 20

Capital: \$ 2,750,000  
Bond Interest (2% of Total): 540,000 Check: 2.25%  
5 Years of Capitalized Interest: 1,800,000 Check: 5.00% /Y (Bond Interest on Total)  
Reserve (10% of Total): 1,875,000 Check: 10.00%  
Total: \$ 6,965,000

Revenue Bond Issue: 20  
Number of Years: 20  
Annual Cost: \$750,000  
Interest on Revenue: 20



SWA Worksheet  
This worksheet calculates the total cost of the SWA supply option, including the cost of the SWA supply option, the cost of the SWA supply option, and the cost of the SWA supply option.

SWA Worksheet  
This worksheet calculates the total cost of the SWA supply option, including the cost of the SWA supply option, the cost of the SWA supply option, and the cost of the SWA supply option.

| Year | First WTP O&M | SWA O&M    | Water Purchase | SWA Revenue  | First WTP O&M | SWA Revenue | Interest on Revenue | TOTAL        |
|------|---------------|------------|----------------|--------------|---------------|-------------|---------------------|--------------|
| 1    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 2    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 3    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 4    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 5    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 6    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 7    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 8    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 9    | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 10   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 11   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 12   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 13   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 14   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 15   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 16   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 17   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 18   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 19   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |
| 20   | \$ 7,012,115  | \$ 675,240 | \$ 1,000,000   | \$ 1,000,000 | \$ 7,012,115  | \$ 675,240  | \$ 1,000,000        | \$ 9,687,355 |

20 Yr Consolidation  
\$ 205,751,155

20 Yr Consolidation  
\$ 707,275,715

**KWA Supply Option Worksheet**  
**Sheet 2**

**Capital:**  
 Price AGO: 12.5400 1.2540 MCF/Day  
 Price AGO: 12.5400 1.2540 MCF/Day

**Annual Volume:**  
 Price: 585,365, 5857  
 Price: 585,365, 5857

**2018 Cost of Supply:**  
 Gas WTR G&P: \$ 39.56 MCF \$ 7,515,138 /Yr  
 WTR: \$ 6.30 MCF \$ 878,886 /Yr

**Injection Definition:**  
 Price: 4.556 /Yr  
 Price: 5.056 /Yr

**Capital Expenditures:**  
 Capital: \$ 557,575,000  
 Bond Interest (2.25% of Total): 12,534,000 12.53%  
 5 Years of Capitalized Interest: 74,685,000 13.56% /Yr (Bond Interest on Total)  
 Reserve (10% of Total): 55,757,500 10.00%  
 Total: \$ 699,551,500  
 WTR's Share (20%) \$ 139,910,300

**Revenue Bond Data:**  
 Number of Years: 25  
 Annual Cost: \$125,000,000  
 Interest on Revenue: 25%

**Capital:** \$ 7,736,000  
 Bond Interest (2% of Total): 154,720 1.99%  
 5 Years of Capitalized Interest: 1,000,000 1.29% /Yr (Bond Interest on Total)  
 Reserve (10% of Total): 773,600 1.00%  
 Total: \$ 8,864,320

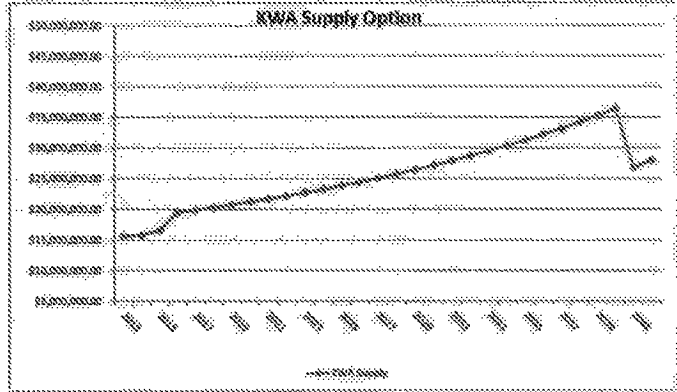
**Revenue Bond Data:**  
 Number of Years: 25  
 Annual Cost: \$750,000,000  
 Interest on Revenue: 25%

**Capital:** \$ 7,736,000  
 Bond Interest (2% of Total): 154,720 1.99%  
 5 Years of Capitalized Interest: 1,000,000 1.29% /Yr (Bond Interest on Total)  
 Reserve (10% of Total): 773,600 1.00%  
 Total: \$ 8,864,320

**Revenue Bond Data:**  
 Number of Years: 25  
 Annual Cost: \$750,000,000  
 Interest on Revenue: 25%

**KWA Revenue**  
**Pre-Bond Entry**

| Year | Price WTR    | WTR Production | Gas & WTR | WTR Revenue | Interest on | Total         |
|------|--------------|----------------|-----------|-------------|-------------|---------------|
| 2012 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2013 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2014 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2015 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2016 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2017 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2018 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2019 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2020 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2021 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2022 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2023 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2024 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2025 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2026 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2027 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2028 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2029 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2030 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2031 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2032 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2033 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2034 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2035 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2036 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2037 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2038 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2039 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2040 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2041 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |
| 2042 | \$ 5,555,555 | 11,111,111     | 1,111,111 | 1,111,111   | 175,180     | \$ 15,999,914 |



**25 Yr Commitment**  
 \$ 699,551,500

**25 Yr Commitment**  
 \$ 750,000,000

DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning both to the Flint WTP

|          |            |          |               |    |      | Water    | Revenue | Interest | TOTAL         |
|----------|------------|----------|---------------|----|------|----------|---------|----------|---------------|
|          |            |          |               |    |      | Purchase | Bond    | on       |               |
| Capacity | Flint ADD: | 0.00 MGD | - MCF/Day     | 1  | 2013 | \$ -     |         |          | \$ 10,001,390 |
|          | DWSD ADD:  | 12 MGD   | 1,604 MCF/Day | 2  | 2014 | \$ -     |         |          | \$ 10,471,456 |
|          |            |          |               | 3  | 2015 | \$ -     |         |          | \$ 10,963,614 |
|          |            |          |               | 4  | 2016 | \$ -     |         |          | \$ 11,478,904 |
|          |            |          |               | 5  | 2017 | \$ -     |         |          | \$ 12,018,412 |
|          |            |          |               | 6  | 2018 | \$ -     |         |          | \$ 12,583,278 |
|          |            |          |               | 7  | 2019 | \$ -     |         |          | \$ 13,174,692 |
|          |            |          |               | 8  | 2020 | \$ -     |         |          | \$ 13,793,902 |
|          |            |          |               | 9  | 2021 | \$ -     |         |          | \$ 14,442,216 |
|          |            |          |               | 10 | 2022 | \$ -     |         |          | \$ 15,121,000 |
|          |            |          |               | 11 | 2023 | \$ -     |         |          | \$ 15,831,687 |
|          |            |          |               | 12 | 2024 | \$ -     |         |          | \$ 16,575,776 |
|          |            |          |               | 13 | 2025 | \$ -     |         |          | \$ 17,354,838 |
|          |            |          |               | 14 | 2026 | \$ -     |         |          | \$ 18,170,515 |
|          |            |          |               | 15 | 2027 | \$ -     |         |          | \$ 19,024,529 |
|          |            |          |               | 16 | 2028 | \$ -     |         |          | \$ 19,918,682 |
|          |            |          |               | 17 | 2029 | \$ -     |         |          | \$ 20,854,860 |
|          |            |          |               | 18 | 2030 | \$ -     |         |          | \$ 21,835,039 |
|          |            |          |               | 19 | 2031 | \$ -     |         |          | \$ 22,861,286 |
|          |            |          |               | 20 | 2032 | \$ -     |         |          | \$ 23,935,766 |
|          |            |          |               | 21 | 2033 | \$ -     |         |          | \$ 25,060,747 |
|          |            |          |               | 22 | 2034 | \$ -     |         |          | \$ 26,238,602 |
|          |            |          |               | 23 | 2035 | \$ -     |         |          | \$ 27,471,816 |
|          |            |          |               | 24 | 2036 | \$ -     |         |          | \$ 28,762,992 |
|          |            |          |               | 25 | 2037 | \$ -     |         |          | \$ 30,114,852 |
|          |            |          |               |    | 2038 | \$ -     |         |          | \$ 31,530,250 |
|          |            |          |               |    | 2039 | \$ -     |         |          | \$ 33,012,172 |
|          |            |          |               |    | 2040 | \$ -     |         |          | \$ 34,563,744 |
|          |            |          |               |    | 2041 | \$ -     |         |          | \$ 36,188,240 |
|          |            |          |               |    | 2042 | \$ -     |         |          | \$ 37,889,088 |
|          |            |          |               |    |      | \$ -     |         |          |               |

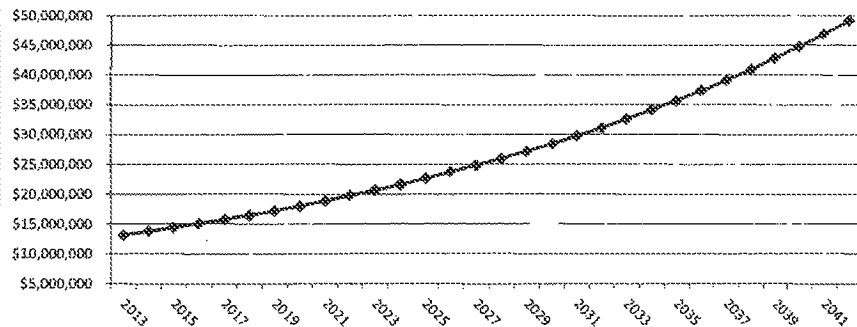
25 Yrs Cumulative

\$ 458,060,853

30 Yrs Cumulative

\$ 631,244,349

DWSD 18 MGD Maximum Day Customer Twinning Option DWSD  
Owns Both Lines



**DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning Only New Line to the Flint WTP**

Capacity

Flint ADD: 0.00 MGD - MCF/Day  
 DWSD ADD: 12 MGD 1,604 MCF/Day

Annual Volume

Flint: - MCF  
 DWSD: 585,561 MCF

2013 Cost of Supply

Flint WTP O&M: - /MCF \$ - /Yr  
 DWSD: \$ 17.40 /MCF \$ 10,188,770 /Yr

Escalation/Inflation Rate

Flint: 4.51% /Yr  
 DWSD: 4.7% /Yr

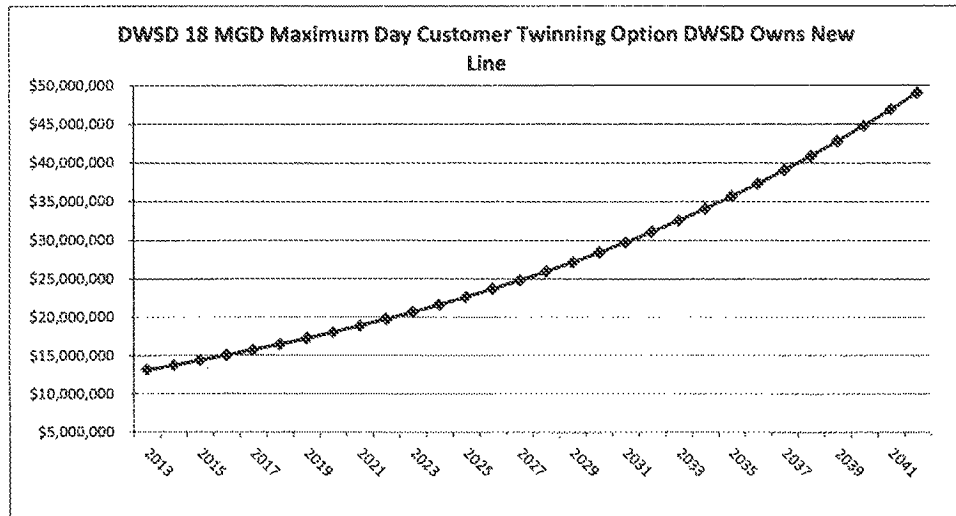
Capital Expenditure

Amount: \$ -  
 Reserve: \$ - 0% Reserve Rate: 0.00%  
 Amount plus Reserve: \$ -  
 Revenue Bond Rate: 5%  
 Number of Years: 25  
 Annual Cost: \$0

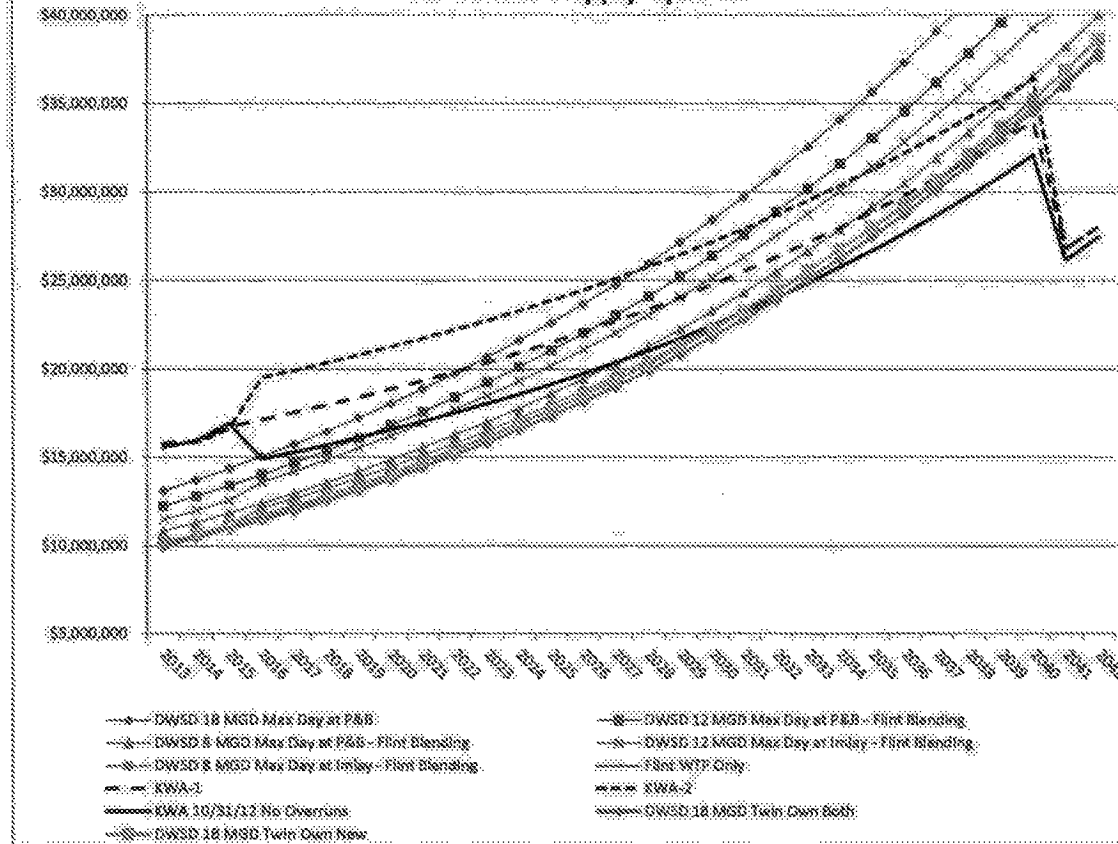
|    | Year | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|----|------|---------------|----------------|----------------------|---------------------|---------------|
| 1  | 2013 | \$ -          | 10,188,770     | -                    | -                   | \$ 10,188,770 |
| 2  | 2014 | \$ -          | 10,667,642     | -                    | -                   | \$ 10,667,642 |
| 3  | 2015 | \$ -          | 11,169,021     | -                    | -                   | \$ 11,169,021 |
| 4  | 2016 | \$ -          | 11,693,965     | -                    | -                   | \$ 11,693,965 |
| 5  | 2017 | \$ -          | 12,243,582     | -                    | -                   | \$ 12,243,582 |
| 6  | 2018 | \$ -          | 12,819,030     | -                    | -                   | \$ 12,819,030 |
| 7  | 2019 | \$ -          | 13,421,525     | -                    | -                   | \$ 13,421,525 |
| 8  | 2020 | \$ -          | 14,052,336     | -                    | -                   | \$ 14,052,336 |
| 9  | 2021 | \$ -          | 14,712,796     | -                    | -                   | \$ 14,712,796 |
| 10 | 2022 | \$ -          | 15,404,297     | -                    | -                   | \$ 15,404,297 |
| 11 | 2023 | \$ -          | 16,128,299     | -                    | -                   | \$ 16,128,299 |
| 12 | 2024 | \$ -          | 16,886,330     | -                    | -                   | \$ 16,886,330 |
| 13 | 2025 | \$ -          | 17,679,987     | -                    | -                   | \$ 17,679,987 |
| 14 | 2026 | \$ -          | 18,510,946     | -                    | -                   | \$ 18,510,946 |
| 15 | 2027 | \$ -          | 19,380,961     | -                    | -                   | \$ 19,380,961 |
| 16 | 2028 | \$ -          | 20,291,866     | -                    | -                   | \$ 20,291,866 |
| 17 | 2029 | \$ -          | 21,245,584     | -                    | -                   | \$ 21,245,584 |
| 18 | 2030 | \$ -          | 22,244,126     | -                    | -                   | \$ 22,244,126 |
| 19 | 2031 | \$ -          | 23,289,600     | -                    | -                   | \$ 23,289,600 |
| 20 | 2032 | \$ -          | 24,384,211     | -                    | -                   | \$ 24,384,211 |
| 21 | 2033 | \$ -          | 25,530,269     | -                    | -                   | \$ 25,530,269 |
| 22 | 2034 | \$ -          | 26,730,192     | -                    | -                   | \$ 26,730,192 |
| 23 | 2035 | \$ -          | 27,986,511     | -                    | -                   | \$ 27,986,511 |
| 24 | 2036 | \$ -          | 29,301,877     | -                    | -                   | \$ 29,301,877 |
| 25 | 2037 | \$ -          | 30,679,065     | -                    | -                   | \$ 30,679,065 |
|    | 2038 | \$ -          | 32,120,981     | -                    | -                   | \$ 32,120,981 |
|    | 2039 | \$ -          | 33,630,667     | -                    | -                   | \$ 33,630,667 |
|    | 2040 | \$ -          | 35,211,309     | -                    | -                   | \$ 35,211,309 |
|    | 2041 | \$ -          | 36,866,240     | -                    | -                   | \$ 36,866,240 |
|    | 2042 | \$ -          | 38,598,953     | -                    | -                   | \$ 38,598,953 |

25 Yrs Cumulative  
 \$ 466,642,790

30 Yrs Cumulative  
 \$ 643,070,941



### Flint Water Supply Options



| Option                        | Costs through 2042 | Ranking |
|-------------------------------|--------------------|---------|
| Flint WTP Only                | \$ 330,841,893     | 1       |
| DWSD 8 MGD Max Day at Inlet   | \$ 634,795,488     | 2       |
| KWA 10/31/12 Update           | \$ 649,775,156     | 3       |
| DWSD 8 MGD Max Day at P&B     | \$ 672,671,705     | 4       |
| KWA-1                         | \$ 707,279,735     | 5       |
| DWSD 12 MGD Max Day at Inlet  | \$ 725,576,803     | 6       |
| DWSD 12 MGD Max Day at P&B    | \$ 762,110,308     | 7       |
| KWA-2                         | \$ 766,784,333     | 8       |
| DWSD 18 MGD Max Day at P&B    | \$ 821,276,758     | 9       |
| DWSD 18 MGD Max Twin Own Both | \$ 631,244,349     |         |
| DWSD 18 MGD Max Own New Line  | \$ 643,070,941     |         |

Summary of FY 2013-14 DWSD Cost Allocations to Flint Under Various Scenarios  
*Flint Only*

|  | Revenue Requirement | Rates and Charges |           |               |
|--|---------------------|-------------------|-----------|---------------|
|  |                     | Fixed             | Commodity | Avg Unit Cost |
| 1 Status Quo ( <i>Flint Portion</i> )    | 12,574,900          | 379,304           | 13.01     | 20.39         |
| 2 Suggested Cct ( <i>Flint Portion</i> ) | 11,281,100          | 351,661           | 12.06     | 19.27         |
| 3 Change                                 | (1,293,800)         | (27,643)          | (0.95)    | (1.12)        |
| 4 % Change                               | -10.3%              | -7.3%             | -7.3%     | -5.5%         |
| 5 Max Day Only                           | 9,904,300           | 294,542           | 10.87     | 16.91         |
| 6 Change                                 | (1,376,800)         | (57,119)          | (1.19)    | (2.36)        |
| 7 % Change                               | -13.9%              | -19.4%            | -10.9%    | -14.0%        |
| 8 Add CTA Line to BP                     | 10,093,100          | 310,271           | 10.87     | 17.23         |
| 9 Change                                 | 188,800             | 15,729            | 0.00      | 0.32          |
| 10 % Change                              | 1.9%                | 5.1%              | 0.0%      | 1.9%          |
| 11 CTA to BP / Flint only to FWTP        | 12,446,300          | 506,371           | 10.87     | 21.25         |
| 12 Change                                | 2,353,200           | 196,100           | 0.00      | 4.02          |
| 13 % Change                              | 18.9%               | 38.7%             | 0.0%      | 18.9%         |
| 14 Add CTA Line to FWTP                  | 10,191,200          | 318,450           | 10.87     | 17.40         |
| 15 Change                                | (2,255,100)         | (187,921)         | 0.00      | (3.85)        |
| 16 % Change                              | -22.1%              | -59.0%            | 0.0%      | -22.1%        |
| 17 CTA to FWTP / Buy existing 72         | 10,009,600          | 303,315           | 10.87     | 17.08         |
| 18 Change                                | (181,600)           | (15,135)          | 0.00      | (0.32)        |
| 19 % Change                              | -1.8%               | -5.0%             | 0.0%      | -1.9%         |
| 20 Cumulative Change                     | (2,565,300)         | (75,989)          | (2.14)    | (3.31)        |
| 21 Cumulative % Change                   | -20.4%              | -20.0%            | -16.4%    | -16.2%        |

|                                  | Assumptions           |                       |                         | DWSD Investment |                  |
|----------------------------------|-----------------------|-----------------------|-------------------------|-----------------|------------------|
|                                  | Avg Day<br><i>mgd</i> | Max Day<br><i>mgd</i> | Peak Hour<br><i>mgd</i> | CTA<br>\$       | Flint Only<br>\$ |
| 1 Status Quo                     | 24.6                  | 45.6                  | 47.7                    | 0               | 0                |
| 2 Suggested Contract             | 23.4                  | 40.6                  | 42.4                    | 0               | 0                |
| 3 Max Day Only                   | 12.0                  | 18.0                  | 18.0                    | 0               | 0                |
| 4 Add CTA Line to BP             | 12.0                  | 18.0                  | 18.0                    | 62,290,800      | 0                |
| 5 CTA to BP / Flint only to FWTP | 12.0                  | 18.0                  | 18.0                    | 62,290,800      | 32,391,300       |
| 6 Add CTA Line to FWTP           | 12.0                  | 18.0                  | 18.0                    | 94,682,100      | 0                |
| 7 CTA to FWTP / Buy existing 72  | 12.0                  | 18.0                  | 18.0                    | 94,682,100      | (2,500,000)      |

TFG

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for  
6106

**WORSE CASE SCENARIO**  
**SUMMARY COMPARISON: KWA V DWSD**  
**(15% Cost Overrun; One year delay in Water Supply delivery)**

**Water and Sewer Cash Flow with KWA**

|                           | Year 1<br>FY13      | Year 2<br>FY14      | Year 3<br>FY15      | Year 4<br>FY16      | Year 5<br>FY17      | Year 6<br>FY18      | Year 7<br>FY19      | Year 8<br>FY20      |
|---------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Current DWSD & FWTP Costs | \$14,413,858        | \$15,355,135        | \$16,365,534        | \$17,450,717        | \$ -                | \$ -                | \$ -                | \$ -                |
| KWA Entry Fee             | \$581,400           | \$581,400           | \$581,400           | \$ -                | \$ -                | \$ -                | \$ -                | \$ -                |
| KWA Debt                  | \$ -                | \$ -                | \$ -                | \$7,582,128         | \$7,582,128         | \$7,582,128         | \$7,582,128         | \$7,582,128         |
| FWTP Debt                 | \$ -                | \$ -                | \$ -                | \$556,651           | \$556,651           | \$556,651           | \$556,651           | \$556,651           |
| KWA operations            | \$ -                | \$ -                | \$ -                | \$ -                | \$922,612           | \$968,953           | \$1,017,401         | \$1,068,271         |
| FWTP operations w KWA     | \$ -                | \$ -                | \$ -                | \$ -                | \$7,185,511         | \$7,544,787         | \$7,922,026         | \$8,318,128         |
| <b>TOTAL COSTS</b>        | <b>\$14,995,258</b> | <b>\$15,936,535</b> | <b>\$16,946,934</b> | <b>\$25,589,496</b> | <b>\$16,247,103</b> | <b>\$16,652,519</b> | <b>\$17,078,206</b> | <b>\$17,525,177</b> |

**Water and Sewer Cash Flow with DWSD**

|                           | Year 1<br>FY13 | Year 2<br>FY14 | Year 3<br>FY15 | Year 4<br>FY16 | Year 5<br>FY17 | Year 6<br>FY18 | Year 7<br>FY19 | Year 8<br>FY20 |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Current DWSD & FWTP Costs | \$14,413,858   | \$15,355,135   | \$16,365,534   | \$17,450,717   | \$18,616,851   | \$19,870,650   | \$21,219,435   | \$22,671,185   |

**Cash Flow Difference: KWA and DWSD**

|                   | Year 1<br>FY13 | Year 2<br>FY14 | Year 3<br>FY15 | Year 4<br>FY16 | Year 5<br>FY17 | Year 6<br>FY18 | Year 7<br>FY19 | Year 8<br>FY20 |
|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Annual KWA - DWSD | \$ (581,400)   | \$ (581,400)   | \$ (581,400)   | \$ (8,138,779) | \$ 2,369,748   | \$ 3,218,131   | \$ 4,141,229   | \$ 5,146,008   |
| Cumulative        | \$ (581,400)   | \$ (1,162,800) | \$ (1,744,200) | \$ (9,882,979) | \$ (7,513,231) | \$ (4,295,100) | \$ (153,871)   | \$ 4,982,137   |

"Worse Case" scenario differs from Original in these respects:

- Delivery of water to Flint from KWA is delayed by one year and construction costs are 15% above the original projection.
- (1) Consequently, the City is required to begin paying for debt service one year before KWA begins delivery of water. This is in addition to its obligation to pay its entry fee of \$581,000 annually for the first 3 years.
- (2) Considering \$9.8 million in upfront costs in the first 4 years prior to KWA operation, the cost of KWA exceeds the cost of DWSD until year 8. Once KWA begins delivering water in year 5, annual operating costs are less than DWSD by 13%.
- (3) Cumulative savings by Year 8 are projected to be \$5 million, compared to \$24 million in the Original projection.



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GLO

Detail of Worst Case Cost Projections

Worse Case Scenario

Cost Comparisons: Water Supply to City of Flint from DWSD and proposed KWA project

Cost of Water to City of Flint (excluding Genesee) using continued service from DWSD

|                              |           | FY13         | FY14          | FY15         | FY16         | FY17          | FY18         | FY19          | FY20          |
|------------------------------|-----------|--------------|---------------|--------------|--------------|---------------|--------------|---------------|---------------|
| Fixed Cost (1)               |           | \$ 4,411,680 | \$ 4,852,848  | \$ 5,338,133 | \$ 5,871,946 | \$ 6,459,141  | \$ 7,105,055 | \$ 7,815,560  | \$ 8,597,116  |
| Commodity Cost (2)           | Escalator | \$ 7,276,640 | \$ 7,640,472  | \$ 8,022,496 | \$ 8,423,620 | \$ 8,844,801  | \$ 9,287,041 | \$ 9,751,394  | \$ 10,236,963 |
| Flint WTP Operating Cost (3) | Escalator | \$ 2,725,538 | \$ 2,861,815  | \$ 3,004,906 | \$ 3,155,151 | \$ 3,312,908  | \$ 3,478,554 | \$ 3,652,482  | \$ 3,835,106  |
| TOTAL                        |           | \$14,413,858 | \$ 15,355,136 | \$16,365,534 | \$17,450,717 | \$ 18,616,851 | \$19,870,650 | \$ 21,219,435 | \$ 22,671,185 |

- (1) Per FY13 Budget and DWSD Contract, fixed charge from DWSD for FY13 is \$707,000 per month or \$8.5 million total. Flint's cost is 52% or \$4.4 million total.
- (2) Per FY13 Budget and DWSD Contract, and based on 12 million gallons per day (mgd), cost is \$7.3 million, based on \$12.46/unit (\$12.46x1600unitsx365).
- (3) Per FY13 Budget, annual cost of WTP is \$4.1 million. Genesee County pays \$1,386,000 for emergency back up service.

Cost of Water to City of Flint using proposed KWA project for water supply to Flint WTP

|                                       |           | FY13         | FY14         | FY15         | FY16              | FY17          | FY18         | FY19          | FY20          |
|---------------------------------------|-----------|--------------|--------------|--------------|-------------------|---------------|--------------|---------------|---------------|
| KWA Entry Costs (1)                   |           | \$ 581,400   | \$ 581,400   | \$ 581,400   | \$ -              | \$ -          | \$ -         | \$ -          | \$ -          |
| Fixed KWA Construction Cost (2)       |           |              |              |              | \$ 7,582,128      | \$ 7,582,128  | \$ 7,582,128 | \$ 7,582,128  | \$ 7,582,128  |
| Fixed Flint WTP Construction Cost (3) | Escalator |              |              |              | \$ 556,651        | \$ 556,651    | \$ 556,651   | \$ 556,651    | \$ 556,651    |
| Flint WTP Operating Cost (4)          | Escalator | \$ 5,911,538 | \$ 6,207,115 | \$ 6,517,471 | \$ 6,843,344      | \$ 7,185,511  | \$ 7,544,787 | \$ 7,922,026  | \$ 8,318,128  |
| KWA Commodity Charge (5)              | Escalator | \$ 759,200   | \$ 797,160   | \$ 837,018   | \$ 878,869        | \$ 922,812    | \$ 968,953   | \$ 1,017,401  | \$ 1,068,271  |
| TOTAL                                 |           |              |              |              | KWA NOT AVAILABLE | \$ 16,247,103 | \$16,662,619 | \$ 17,078,206 | \$ 17,526,177 |

- (1) The City will, upon joining, be required to pay a fee of \$32,300 per MGD for each year until bonding for the project is obtained. At 18MGD, the City's cost is \$581,000 annually. It is projected that fee will be assessed for 3 years.
- (2) Per KWA proposal, project cost is \$272 million. City's fixed cost would be 30% of debt service, based on capacity design of 60mgd, of which 18MGD is for Flint. Debt service is based on 5% interest rate @ 25 years; 5% added to principal for capitalized interest for FY13, FY14, and FY15. (\$272,421,588 plus \$13,621,078 for 3 years = \$313,284,792). The costs here are increased by 15%; debt service starts in FY16 but water is not available until FY17.
- (3) Per KWA proposal, the cost of upgrading the Flint is \$6 million. City's fixed cost would be 100% of debt service based on 5% interest rate @ 25 years, with 5% added to cover capitalized interest for FY13, FY14, and FY15. (total principal = \$6.9 million). Again, costs here are increased by 15%; debt service starts in FY16 but water is not available until FY17.
- (4) Per FY13 Budget annual cost of WTP is \$4,111,538. \$1.6 million for electricity and chemicals & 2 FTE's are added. 100%
- (5) Per KWA proposal, initial commodity charge would be based on \$1.30/unit or 7,500 gallons. Charge is based on 12MGD.

## **Karegnondi (KWA) - 7 contracts & 2 district offices**

### **Major components:**

Lake Huron Intake/Pipeline  
2 Pump stations (LHPS, IPS)  
50 miles of 66" and 60" steel trans main

### **Specific Contracts**

Contract S-4000 Intake Crib & Pipeline - Sag Bay lead  
Contract S-4001 Lake Huron PS – Sag Bay lead  
Contract S-4002 12.5 miles of 66" pipeline – Sag Bay lead  
Contract S-4003 12.5 miles of 66" pipeline – Sag Bay lead  
Contract S-4004 IPS – Sag Bay lead  
Contract S-4005 12 miles of 60" pipeline – LDO lead  
Contract S-4006 13 miles of 60" pipeline – LDO lead

\* Contract S-4007 Flint Trans main – 14 miles of 36" main -  
LDO lead

### **Challenges along the way:**

Number of contracts and consultants – standardization of specs  
Surge analysis  
Endangered species  
Wetlands permit/stream x-ing



## Michigan Department of Health and Human Services Flint Blood Lead Levels Communication Plan October 1, 2015

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### Situation overview:

After a change in the water source for Flint residents, there have been concerns related to the level of lead in the water and its impact on the community. As a result, the Michigan Departments of Health and Human Services, and Environmental Quality, are working with the local health department and Hurley Children's Hospital to analyze the situation and determine next steps.

### Goals/objectives:

- Ensure public health partners and the elected officials are aware of MDHHS data analysis.
- Announce availability of water filters for Flint residents.

### Audiences:

- Media/Flint residents
- Governor's Office
- Congress and Legislature
- Public Health Partners: Genesee County Health Department and Hurley Children's Hospital
  - Mark Valacek, LHD Health Officer
  - Gary Johnson, LHD Medical Director
  - Mona Hanna-Attisha, MD
  - Lawrence Reynolds, MD
  - Paul Joice, Dept. of Housing and Urban Development

### Action steps/tools with timeline:

1. Friday, October 2:
  - *Timing TBD*: Provide data to Hurley Children's Hospital and Genesee County Health Department
  - *Timing TBD*: Notify Congressman Kildee and local elected officials of announcement
  - 1:30 p.m.: Press event with MDHHS, DEQ, EPA
    - i. Issue joint Press Release
  - Schedule 1x1 Media Interviews with Dr. Eden Wells
    - i. Kristi Tanner, Detroit Free Press
    - ii. Ed White, Associated Press
    - iii. Ron Fonger, MLive
    - iv. Sarah Hulett, Michigan Radio
2. Week of October 5-9
  - Schedule visit at Flint MDHHS office and Director Lyon
    - i. Invite media?
  - Follow up with Kristi Tanner: Detroit Lead Analysis

MDHHS Topline Messages:

- Initial analysis of MDHHS data found that blood lead levels (BLLs) of children in Flint have followed the seasonal trend. While this analysis of Flint as a whole remains true, after a more comprehensive analysis by our epidemiologists, the MDHHS has found that state data is consistent with the data presented by Hurley for specific zip codes.
- Upon conducting an analysis to analyze the zip codes within Flint that Hurley used in their study, MDHHS data does show that since the water source change in Flint has occurred, there has been an increase in childhood elevated lead levels in these communities.
- MDHHS is recommending that residents follow the Public Health Advisory issued by the Genesee County Health Department, as well as take further steps to reduce exposures to all forms of lead in and around their homes.
  - We understand that cost may be a barrier to following the recommendations of the local health department. We are actively working with public and private partners to make resources available to those who may need assistance.

# IS YOUR CHILD SAFE FROM LEAD POISONING?



## LEARN HOW TO PROTECT YOUR FAMILY: CREATE A LEAD SAFE HOME

### What causes lead poisoning?

There are many places in a home that can put babies and children in danger of lead poisoning.

Lead paint is the #1 cause of lead poisoning in Michigan and is often found in homes built before 1978. The older the home, the more likely that painted surfaces like windows, cupboards, doors and porches will contain lead paint.

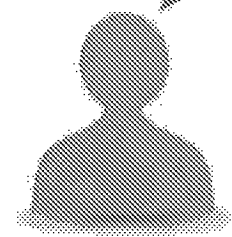
Lead poisoning occurs most often when children come in contact with lead in the air, in dust particles and in lead paint. Lead dust is created when windows are opened and closed, or when surfaces age and paint chips or peels. When dust and chips fall on the floor they get on hands and toys. When a child puts hands or toys in their mouth, they can become lead poisoned.

### How can I tell if my child has lead poisoning?

Talk to your doctor about testing your child's blood for lead poisoning.

**When should my child be tested for lead poisoning?**

Children should be tested at one and two years of age or if you think your child has been exposed to a lead hazard.



To learn more about lead poisoning prevention and blood lead testing, call the Childhood Lead Poisoning Prevention Project:

**(517) 335-8885**

**(888) 322-4453**

### Take this quiz to see if your child may have lead poisoning:

Symptoms of lead poisoning can be silent—and hard to recognize. Preventing lead poisoning before it happens is the best way to keep your family safe. Take this quiz to see if your child may be at risk:

Does your child currently live in a home built before 1950 or have they lived in a home built before 1950 in the recent past? Do they spend time at or often visit a home built before 1950?

Yes No Don't know

Does your child currently live in a home built before 1978 that was recently remodeled? Have they lived in or often visited a home built before 1978 that was recently remodeled?

Yes No Don't know

Does your child have a brother, sister or playmate with lead poisoning?

Yes No Don't know

Does your child live with an adult whose job or hobby involves lead?

Yes No Don't know

Does you or your child's caregiver use home remedies that may contain lead?

Yes No Don't know

If you answered NO to all of these questions, your child is probably not at risk for lead poisoning. If you answered YES or DON'T KNOW to any of these questions, talk to your doctor about testing your child for lead poisoning.

# SAFE CLEANING IN YOUR HOME

Use these steps to help keep your home clean and reduce your child's risk of exposure:



**Put on gloves.** If you do not have rubber gloves, wash your hands well after cleaning.

**Use the right cleaners and disposable supplies.** Use soapy cleaners or products made to remove lead dust.



**Remove paint chips first.** Window areas and porches often have peeling paint and lead dust. Pick up visible chips and dispose of them in a plastic bag.

**Always wet-mop floors and window sills.** Do not broom lead dust. Dispose of cloths after wiping each area. If using a mop, replace water frequently.



**When using a vacuum, make sure it is a HEPA vacuum.** Some health departments have HEPA vacuums available to borrow.

**Rinse after cleaning.** Use clean water and a new mop head or fresh paper towels to wipe away suds.

**Always empty wash water down a toilet.**



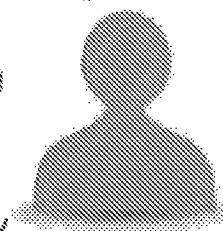
**Repeat these steps often** when dirt and dust appear on floors, porches, window wells, window sills, stairs and children's play areas.

**Note:** Areas that should be cleaned include windows, doors, floors, porches, stairs and child play areas.

**Important:** Do not use your vacuum. It will spread lead dust into the air you breathe.

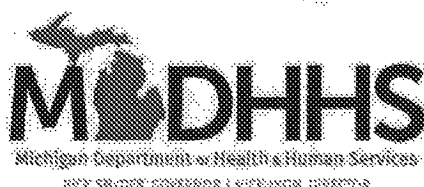
## What can I do to protect my child from lead?

- Wash hands, bottles, pacifiers and toys often.
- Always take off shoes before going into the house.
- Flush your pipes before drinking, and only use cold water for cooking and mixing formula. Flush pipes by running the water for approximately 5 minutes.
- Watch your child's diet. Foods high in calcium and iron help keep lead from being absorbed by a child's body.
- Avoid using power sanders, open-flame torches, heat guns, dry scrapers and dry sandpaper on painted surfaces.
- Fix peeling or chipping paint.
- Use a certified Repair and Remodeling Professional when making updates to your home.
- Practice safe cleaning methods.



Thinking about remodeling your home? Need advice about identifying and removing lead paint? Call the Lead and Healthy Homes Section: 866-691-LEAD.

[www.michigan.gov/lead](http://www.michigan.gov/lead)





STATE OF MICHIGAN  
EXECUTIVE OFFICE  
LANSING

RICK SNYDER  
GOVERNOR

BRIAN CALLEY  
LT. GOVERNOR

**CONTACTS:**

Sara Wurfel or Dave Murray  
Governor's Office: 517-335-6397

Brad Wurfel, 517-284-6713  
Department of Environmental Quality

Jennifer Eisner, 517-230-9804  
Department of Health and Human Services

**FOR IMMEDIATE RELEASE**

Friday, Oct. 2, 2015

## **Gov. Rick Snyder: Comprehensive action plan will help Flint residents address water concerns**

*Collaborative effort with state, federal and city leaders focuses on testing, assistance*

FLINT, Mich. — Flint residents need to have access to safe, clean, water now and long into the future, Gov. Rick Snyder said, announcing a comprehensive action plan created with state, federal and city leaders to address concerns about drinking water.

The water leaving Flint's drinking water system is safe to drink, but some families with lead plumbing in their homes or service connections could experience higher levels of lead in the water that comes out of their faucets.

The action plan focuses on increasing water testing, offering additional precautions for families with lead plumbing in their homes, and providing long-term solutions to address the city's water infrastructure challenges. The plan was created at Snyder's direction by the Michigan Departments of Environmental Quality (DEQ) and Health and Human Services (DHHS), the U.S. Environmental Protection Agency, and the city of Flint.

"We are focused on helping ensure safe, clean, accessible drinking water and addressing and mitigating concerns and protecting public health," Snyder said. "Today's action plan builds upon ongoing work with local, state and federal agencies and our partnership with city and community leaders. Together, we are working to ensure that all Flint residents have accurate information and know that help is available to address potential problems."

The city and the state also are working together to gather more data to ensure the water that leaves the treatment plant as well as the water that arrives in Flint homes is safe for all residents. The plan includes:

- Testing in Flint public schools immediately to ensure that drinking water is safe, with testing also available at no cost to any other school in Flint.
- Offering free water testing to Flint residents to assure their drinking water is safe.

- Providing free water filters to residents.
- Expanding health exposure testing of individual homes.
- Accelerating corrosion controls in the Flint drinking water system.
- Accelerating water system improvements to address replacing lead service lines.
- Expediting the completion of the Karegnondi Water Authority pipeline.
- Expanding a Safe Drinking Water Technical Advisory Committee to ensure the best technology, practices and science are being followed by adding an expert from the Environmental Protection Agency's Office of Research and Development to the group.
- Naming Dr. Eden Wells, chief medical executive for the Michigan Department of Health and Human Services, as the Flint drinking water public health adviser.
- Boosting a comprehensive lead education program to make sure residents have detailed information about how to protect themselves and their homes.

Residents can have their water tested by calling 810-787-6537 and pressing 1, or emailing [flintwater@cityofflint.com](mailto:flintwater@cityofflint.com). The DEQ is covering the cost of this testing.

State leaders have been working closely with state and federal lawmakers to tap resources at all levels of government to address concerns.

State health experts said there has been an increase in elevated childhood blood lead levels in some specific communities. Initial analysis of MDHHS data found that blood lead levels of children in Flint have followed an expected seasonal trend. While this analysis for Flint as a whole remains true, a comprehensive and detailed review breaking down data by ZIP codes with the city revealed that MDHHS data is consistent with a study presented recently by Hurley Children's Hospital.

"While we cannot conclusively say that the water source change is the sole cause of the increase, this analysis supports our efforts as we take active steps to reduce all potential lead exposures in Flint," MDHHS Director Nick Lyon said. "As part of this, we are working closely with our public and private partners to provide Flint residents on MDHHS assistance programs with free water filters and inform families about the steps they can take to reduce all lead exposures in their home."

As a part of the action plan, National Sanitation Foundation certified water filters will be made available to Flint residents through emergency state funds and coordinated efforts with local community agencies and donors. Information about how to obtain the filters will soon be available.

"This action plan offers concrete steps we will take in a local, state and federal partnership to ensure all Flint residents have safe water to drink," DEQ Director Dan Wyant said. "The DEQ will work closely with the city to gather further data to ensure the water that leaves Flint's system as well as the water that arrives in Flint homes is safe to drink."

Additional information is available at [www.michigan.gov/flintwater](http://www.michigan.gov/flintwater).

###



Dr. Eder Wells, OHAHS

Child ~~lead~~<sup>lead</sup> blood levels in 5 zip codes

2.7 x higher before

3.2 x higher after switch to Flint River

Others (zip codes)

2 x higher before

" 2 x " after switch

Mayor: recommend following co H.D. rec'd<sup>s</sup> test + flush

1st priority - Expectant women + children < 5

Will work w DED to optimize as quickly + responsibly as possible

In communication w DWSN

\$1.5 - \$2.0M/mo. but still on the table

Improving Infrastructure is imp. - Gap in CIP exist<sup>s</sup> - want to replace 16 SL's

You can't "OCC T" your way out of this problem

Bacteriological Monitoring Program - indication of overall water quality



## **Frequently Asked Questions: Water Lead Levels in the City of Flint September 2015**

### **How can lead get into drinking water?**

Lead detections in Flint drinking water exist at the home level. Sampling at the Flint Water Treatment Plant has shown no lead in its treated water. However, this contaminant leaches into water from a home's lead service lines, lead solder, and leaded plumbing materials including fixtures, faucets, and fittings.

### **Does the city meet federal drinking water standards for lead and copper?**

Yes, the city is meeting state and federal guidelines for lead and copper.

The City of Flint has regularly monitored for lead and copper since federal law began requiring it in 1991.

When the City changed water sources in May 2014, state and federal law required the city to sample for lead and copper for a full year to determine how the water may be interacting with residential lead plumbing to increase lead levels. While the city's results show residential lead levels below the federal threshold for immediate response activities, Flint is moving quickly to optimize corrosion control measures in its water system.

### **Some individual homes showed high numbers for lead. Isn't that a concern?**

For the homeowner, yes it is. There is no "safe" level for lead, and while the leading cause of lead poisoning around the country is lead paint, any source of lead ingestion is worthy of concern.

But the State and federal guidelines for lead and copper acknowledge an important reality: Any home that has a lead service connection or lead plumbing will impart some varying amount of lead into the home's water. The only way to eliminate lead in a home water system is to remove lead plumbing or replace lead service connections to the city system.

The lead and copper rule requires the local operator to sample dozens, sometimes hundreds of homes in the service area to get a general sense of how the water supply is interacting with lead plumbing and service connections. The tests are done specifically at homes with lead service connections. Individual results vary and all participants are

### **Are there other ways the city monitors for lead exposure?**

The County Health Department, overseen statewide by the Michigan Department of Health and Human Services, regularly monitors blood levels in children throughout Michigan communities. The leading cause of lead poisoning is exposure to lead paint.

Blood lead level testing results for the 12-month period just after the City of Flint changed its water source (May 2014 – April 2015) showed no significant change in the pattern of blood lead levels in Flint, compared to the previous three years. This data suggests the recent change in water source by the City of Flint has not contributed to an increase in lead exposure throughout the community.

### **How does the state decide if the water is creating a lead problem?**

Compliance with the federal lead rule is based on a 90<sup>th</sup> percentile calculation. If more than 10 percent of samples report lead above the federal action level of **15 parts per billion**, a water supply has an "action level exceedance." An exceedance is not a violation. It triggers other requirements which could include public notification, additional water quality sampling, and possibly further treatment.

While some of Flint's individual samples exceeded the 15 parts-per-billion lead action level, compliance is based on **the 90<sup>th</sup> percentile of samples**. The City of Flint's 90<sup>th</sup> percentile level has ranged between 0 parts per billion in 2008 and 2011, and 15 parts per billion in 1992, but never exceeded the action level.

The two most recent sampling periods, in 2014 and 2015, were 6 parts per billion and 11 parts per billion, respectively.

### **Did the city use every sample they got back?**

Sampling requirements for lead and copper are designed to target the most common pathways to lead ingestion in homes with the least protection. The sample must be collected from a commonly used kitchen or bathroom tap, and in accordance with the provided sampling instructions. Homes that employ filtration or additional treatment cannot be included. Samples must also be collected within the established monitoring period.

### **I have a lead service connection or lead plumbing. What should I do?**

Replacement is the only way to eliminate lead exposure. However, here are some interim steps homeowners can take to reduce it:

Flush pipes before drinking, and only use cold water for consumption.

The more time water has been sitting in your home's pipes, the more lead it may contain. When water in a particular faucet has not been used for six hours or longer, "flush" cold-water pipes by running the water until it becomes as cold as it will get. This could take five to 30 seconds if there has been recent water use elsewhere in the home, such as showering or flushing toilets. Otherwise, it could take two minutes or longer.

Use only water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead.

**Who is responsible for replacement of lead materials?**

Replacement of service pipes on private property and any lead plumbing materials within the home is a **homeowner's responsibility**. The City of Flint owns the service pipe from the water main to the curb stop valve, and that is **the City's responsibility**. This valve is normally located two feet in from the street curb. From there to the house is private property and the responsibility of the homeowner.

**Why doesn't the city at least replace its portion of lead service lines?**

Partial lead service line replacement has been shown to mobilize more lead and make the situation worse. Only full lead service line replacement has been demonstrated effective in achieving long-term reductions in drinking water lead levels.

**What is the City's timeline for installation of corrosion control treatment?**

The federal government allows the steps to complete the installation of optimal corrosion control treatment and follow-up monitoring to take up to five years.

However, the City of Flint has committed to completing installation of Optimized Corrosion Control Treatment in **less than six months**.

**What will happen when Flint joins the Karegnondi Water Authority next year?**

The City has committed to having Optimized Corrosion Control Treatment in place prior to its connection with the Karegnondi Water Authority (KWA). The water provided by KWA will come from a new source, Lake Huron. The city will continue its lead and copper sampling every six months. Additionally, the city's water treatment plant will continue to operate with uninterrupted Optimized Corrosion Control Treatment.

**How long would it take to replace lead service lines throughout Flint?**

The city has about 32,900 service connections in total. **More than 15,000** of these connections are considered lead service lines. Even if many crews were contracted, it would likely take up to 15 years to complete this work.

**What would it cost to replace the lead service line at my house?**

Average costs to replace a lead service line at an individual home range from \$2,000 to \$8,000. Costs vary depending on the length and size of service line that is needed, as well as the ground cover and soil conditions encountered.

With more than 15,000 lead service lines at an estimated average cost of \$4,000 for each replacement, total cost could **be \$60 million or more**.

## Blood Lead Levels in Flint Talking Points

### October 1, 2015

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- Initial analysis of MDHHS data found that blood lead levels (BLLs) of children in Flint have followed an expected seasonal trend; due to small numbers further analysis was initiated.
- While this analysis of blood lead levels in Flint as a whole remains true, after a comprehensive and detailed review down to the zip code level, we have found that the state analysis is consistent with that presented by Hurley;
- Director Lyon is working closely with DEQ and the administration to take active steps to reduce all potential lead exposures in Flint, and across the state.
- Our Chief Medical Executive has been in communication with the lead investigator at Hurley Children's Hospital, and we continue to work with Hurley, the city of Flint, local and state leaders to verify and analyze data trends.
- Zip code-level data does show that there has been an increase in elevated childhood blood lead levels in specific communities.
  - This does not conclusively mean that the water source change is the sole cause of the increase, but data does show an association.
  - There is an increased proportion of children with elevated Blood Levels (ELBs) in several zip codes, particularly 03 and -04. These appear to have increased over the last 1.5 years.
  - Lead exposure can occur from a number of different sources (such as paint, gasoline, solder, and consumer products) and through different pathways (such as air, food, water, dust, and soil).
  - Although there are several exposure sources, lead-based paint is still the most widespread and dangerous high-dose source of lead exposure for young children in the US and Michigan.
- We reviewed MDHHS statewide data using the same methodology used by Hurley, looking at our numbers by zip code and age ranges, and filtering out non-Flint children.
- Routine surveillance of blood lead levels does not analyze data down to the zip code level. Detailed analysis like this occurs when there is reason to focus in on precise locations or populations.
- MDHHS will be working closely with the Michigan Department of Environmental Quality, Hurley Children's Hospital, the Genesee County Health Department, and community organizations to initiate further action steps.

- We understand that cost may be a barrier to following the recommendations of the local health department. We are actively working with public and private partners to make resources available to those who may need assistance.
- MDHHS is recommending that residents follow the Public Health Advisory issued by the Genesee County Health Department, as well as take further steps to reduce exposures to all forms of lead in and around their homes.

#### *MDHHS Stats and Facts*

- Data charts/breakdowns and explanations--
- Lead abatement through MDHHS was federally funded up until FY14 when Michigan began providing additional funds to abate homes.
- In FY14, \$1.25M General Fund was added. In FY15, General Fund was bumped up to \$1.75M and FY16, General Fund remains at \$1.75M.

did not  
cover DW  
sources of Pb

#### *Reducing and Removing Lead Exposure*

- In housing built before 1978, it can be assumed that the paint has lead unless tests show otherwise.
- Make sure your child does not have access to peeling paint or chewable surfaces painted with lead-based paint.
- Children and pregnant women should not be present in housing built before 1978 that is undergoing renovation. They should not participate in activities that disturb old paint or in cleaning up paint debris after work is completed.
- Create barriers between living/play areas and lead sources. Until environmental clean-up is completed, you should clean and isolate all sources of lead.
  - Close and lock doors to keep children away from chipping or peeling paint on walls. You can also apply temporary barriers such as contact paper or duct tape, to cover holes in walls or to block children's access to other sources of lead.
- Regularly wash children's hands and toys. Hands and toys can become contaminated from household dust or exterior soil. Both are known lead sources.
- Regularly wet-mop floors and wet-wipe window components. Because household dust is a major source of lead, you should wet-mop floors and wet-wipe horizontal surfaces every 2-3 weeks.
  - Windowsills and wells can contain high levels of leaded dust. They should be kept clean. If feasible, windows should be shut to prevent abrasion of painted surfaces or opened from the top sash.
- Take off shoes when entering the house to prevent bringing lead-contaminated soil in from outside.

- Prevent children from playing in bare soil; if possible, provide them with sandboxes. Plant grass on areas of bare soil or cover the soil with grass seed, mulch, or wood chips, if possible.
  - Until the bare soil is covered, move play areas away from bare soil and away from the sides of the house. If you have a sandbox, cover the box when not in use to prevent cats from using it as a litter box. That will help protect children from exposure to animal waste.
- Avoid using makeup, containers, cookware, or tableware to store or cook foods or liquids that are not shown to be lead free.
- Remove recalled toys and toy jewelry immediately from children.
- Use only cold water from the tap for drinking, cooking, and making baby formula. Hot water is more likely to contain higher levels of lead. Most of the lead in household water usually comes from the plumbing in your house, not from the local water supply.
- Shower and change clothes after finishing a task that involves working with lead-based products such as stained glass, making bullets, or using a firing range.

#### *WIC Children*

- There are 855 infants participating in WIC in Flint
- In homes with infants on WIC, if the household has documentation from an official source of unsanitary water supply issues, that family may be eligible to receive ready-to-feed formula. Families should contact WIC to see if they are eligible.
- Each household would have to be looked at on an individual basis.
- WIC cannot cover bottled water.

#### *Background*

- The results of the Hurley Children's Hospital were reviewed by MDHHS after the study was released last week.
- The analysis that Hurley conducted was different from the initial MDHHS data regarding blood lead levels in Flint.
- MDHHS initial data looked at the entire blood lead levels for the Flint area for the past five years and showed the annual seasonal trends in the area.
- Seasonal exposure is higher in the summer for a variety of reasons including children playing outside in the soil, and when windows are open and lead paint is more likely to be in the air. Further, seasonal variations in water can occur due to changes in temperature, pH, and other factors

Flushing



# Recommended Screening Strategies For Assessing and Reducing Lead in Drinking Water in Schools and Child Care Facilities

## Introduction

Michigan Department of Environmental Quality (DEQ) (*and DHHS?*) has developed screening strategies to assist schools and child care facilities to minimize the amount of lead in drinking water. The issue of lead in drinking water has returned to both the local and national spotlight after years of relative calm. Lead is a serious health issue and too much lead in the human body can cause damage to the brain, nervous system and red blood cells. Young children face the most danger from lead exposure because their bodies adsorb lead more easily than adults.

According to the Centers for Disease Control, the major source of lead exposure for children is lead based paint and lead contaminated dust found in older buildings. However, lead in drinking water can contribute to overall lead exposure. Lead is rarely found in water leaving a municipally owned and operated water treatment plant or water mains as it travels through the distribution system. However, lead can enter drinking water as it comes into contact with lead service lines, solder, faucets, drinking fountains, fixtures or other plumbing components that may contain lead.

The intent of this document is to assist school and day care administrators, health officials, water suppliers and other interested parties steps they can take to identify and correct any sources of lead. Recommended strategies include:

- Identify and prioritize sample sites where water is used for drinking, cooking or other consumptive purposes.
- Develop and sampling plan including sampling protocol.
- Conduct initial sampling, and if necessary, follow-up sampling.
- Implement short and long term remedies.
- Communication

## Identify and prioritize sample sites

It is recommended that all faucets, taps and outlets that are used regularly by students and staff for drinking, cooking, making coffee or food preparation to be initially sampled. High priority sites would include:

- Drinking Fountains (both bubblers and water cooler style)\*.
- Kitchen Sinks, faucets or taps.
- Breakroom, classroom, teachers' lounge or other sinks known to be or visibly used for consumption (water glasses or coffeemaker and/or cups are nearby).
- Ice Makers

*(do we want to recommend that a sample also be collected from a tap closest to the service line as possible?)* Consider the fact that actual usage may change over time. Technically, any tap/outlet for potable water is a potential source of drinking water and with limited funds you want to prioritize sampling sites based on potential use and risk.

\* Check for Recalled Water Coolers. Certain water coolers were recalled by the Consumer Product Safety Commission in 1990 because they were manufactured with lead-lined tanks. Other coolers had other lead containing parts or lead solder. See appendix ??.

### **Sampling Plan and Procedures**

A written sampling plan is useful to ensure samples are collected in a systematic, consistent manner. A sampling plan will clarify procedures and personnel to be involved in the sampling program and identify specific taps/outlets to be tested for lead. A detailed description of sampling protocol and collection procedures should also be included within a sampling plan. Below are the DEQ (and DHHS) recommended procedures for collecting samples of water for lead testing.

1. Obtain a 250 milliliter (ml) (or 1 liter?) sample container from the certified laboratory performing the analysis. Carefully follow the instructions provided by the lab.
2. Collect all water samples before the facility opens and before any water is used. Ideally, the water should sit in the pipes unused for at least 8 hours but not more than 18 hours before a sample is collected.
3. Do not collect samples in the morning after a vacation, weekend or holiday. These results will likely be higher because of the extended contact time with the water.
4. Assign an appropriate sample Identification (ID) number to each sample collected. This number should reflect the type of tap/outlet and location. Record this number on the sample container and on a recordkeeping form.
5. Deliver or ship the samples to the lab as instructed.

### Initial and Follow-Up Sampling

The DEQ (and DHHS?) recommend a two-step sampling protocol for identifying lead contamination, especially in large buildings that might require many samples to be collected. First, initial samples are collected to identify the location of taps/outlets that are providing water with high levels of lead. Second, follow-up samples are taken at problem locations. The results of the initial and follow-up samples are then compared to determine the sources of contamination and appropriate corrective measures

**Initial screening samples** are taken to determine the lead content at specific taps/outlets within a facility. The goal of the initial screening is to identify problem taps/outlets or areas of high lead concentrations. These samples are "first draw, morning" samples where the water is the first volume of water emitted from an outlet an 8 to 18 hour stagnation period. If the initial results are at or below (5 ,15, or 20 ppb?), the water (is considered safe?) at that location may continue to be used for drinking and consumptive purposes.

If the initial test results are greater than 20 ppb for a tap/outlet, **follow-up** testing is strongly recommended. Follow-up samples involve the collection of water at a tap/outlet where the water has run for 30 seconds\*. As with the initial testing, follow-up samples are collected before the facility opens and before any water is used. This approach is designed to analyze the lead content of the water in the plumbing behind the wall and the tap/outlet. This is in contrast to the

initial sample that measures the lead content of the water in the tap/outlet itself. A comparison is then performed to determine where the lead may be getting into the water from the tap/outlet or from the plumbing behind the tap/outlet. Appropriate corrective measures can then be taken.

\* Let the water run on refrigerated water fountains or coolers for 15 minutes.

### **Short and Long Term Remedies**

Short-term as well as permanent solutions must be found when lead risks are identified. Interim steps can be taken while you are waiting for test results or until permanent solutions can be put into place. There is no one method for determining which responses will be most effective. Decisions will need to be based on the age/condition of your plumbing, the nature of the water supply, the testing results, and the sources of lead contamination. Remedies are site-specific and are driven by the follow-up test results. It is crucial to determine the source/s of lead contamination prior to instituting solutions.

#### Recommended Short Term Control Measures

- Clean debris from all accessible screens frequently. If you discovered sediment in faucet screens, have the sediment tested and continue to clean screens frequently.
- Use only cold water for food and beverage preparations in cafeterias and cooking classes. Hot water will dissolve lead more quickly than cold water and is therefore more likely to contain increased lead levels.
- Flush the piping system in your facility. Do not use first flush water that has been in contact with the facility plumbing for more than 6 hours. Flushing involves opening all suspect taps/outlets every morning before the facility opens and letting the water run for a period of time to clear water standing in the interior pipes and taps/outlets.
- Locate the tap/outlet furthest from the service line on each wing and floor; open the tap/outlet wide and let the water run for 10 minutes. For precise results, calculate the volume of the plumbing and flow rate – an exact determination would probably need to be made by a plumber or engineer.
- Open all valves at all drinking water fountains without refrigeration units and let the water run for 1 minute.
- Let the water run on refrigerated water fountains for 15 minutes. Because of the long time period required, routine flushing of these units may not be practical and it may be necessary to replace them with lead-free units.
- Open all kitchen taps/outlets (and any other taps/outlets used for drinking and/or cooking purposes) and let water run for 1 minute.
- You may also wish to consider providing bottled water. This can be an expensive alternative. If this should be your choice, DEQ recommends that you provide bottled water that meets Food and Drug Administration and (*Michigan Department of Agriculture and Rural Development?*) standards.

## Recommended Long Term Control Measures

There are a number of long-term actions that might reduce or eliminate sources of lead contamination that originate in your facility's plumbing. The results of testing will give you the information to help determine which treatment options will be most appropriate for your circumstances.

Lead levels can be reduced at the tap/outlet by point-of-use (POU) devices. Carbon filters Reverse osmosis and distillation units are commercially available and can be effective at removing lead. The device should be approved as meeting NSF Standard 53, NSF Standard 58 or equivalent. It must be installed, operated, and maintained in accordance with manufacturer's recommended procedures.

Existing wires grounded to water pipes can possibly be removed by a qualified electrician and an alternative grounding system could be installed.

If the source of lead contamination is localized or limited to a few taps/outlets, replacing the taps/outlets might be the most practical solution. A tap/outlet may be replaced with a new "lead free" one if the existing tap/outlet is suspected to be the contamination source.

Replace suspected sources of lead, including lead pipe, lead solder, brass plumbing components, and brass faucets with lead free alternative.

## **PUBLIC EDUCATION**

A lead control program should contain a public education component. This section will discuss the mandatory public notice requirements for reporting lead test results under the Lead Contamination Control Act (LCCA) and discuss the importance of developing an overall communication strategy.

### Mandatory Public Notice Requirements of the LCCA

Schools and day care facilities conducting a lead-in-drinking water sampling program must comply with the public availability requirements of the LCCA. There are two separate public availability requirements with which schools and day care facilities must comply:

1. Make available a copy of the sampling results for "inspection by the public, including teachers, other personnel, and parents." Any facility conducting sampling for lead should make public any test results. In addition, they advocate identifying activities that are being pursued to correct any lead problems found.
2. Notify relevant parent, teacher and employee organizations of the availability of your sampling program results.

### Public Notification Methods

There are five basic public notification methods that can be applied to communicate lead in drinking water issues and the meaning and significance of your sampling program results. Choose the method that best suits your situation. *Remember, you should not provide sampling*

*program results to the public without providing a basis for interpreting and understanding the significance of those results.*

1. Press Release - A press release in a local newspaper can inform a broad range of the local public about lead in drinking water issues and the results of your testing program. It is important that a release inform readers of how to obtain the results and other information. It would be useful to provide a telephone number for an informed facility official.
2. Follow-up Letters - Letters represent the most direct methods of communicating the lead in drinking water issues to parents and members of your facility. The letters should be mailed directly to any existing address list.
3. Mailbox or Paycheck Stuffers - Stuffers are a very direct method of communicating with personnel. Stuffers should contain the same information contained in letters or press releases.
4. Staff Newsletter - A notice contained in a staff newsletter is another option for direct and effective communication with employees.
5. Presentations - Presentations or briefings at facility related meetings can also be effective. Relevant events for schools would include meeting of parent-teacher organizations, faculty, and the school board.

#### Components of an Effective Communication Strategy

Lead in drinking water may be an emotional and sensitive issue. The communication and outreach activities should not be viewed as stand-alone, but as a part of an overall communication program. The communication strategy should provide a means of addressing questions and providing up-to-date information about sampling and remediation efforts. Ideally, a spokesperson or task force should be available to interact with the public to ensure message consistency.

Issues that will need to be addressed as a part of the communication strategy should include: Participants, timing of delivery, contents of message, and methods and manner of communication.

#### Participants

Those with primary interests and involvement in control of lead in drinking water:

State and EPA Regions: The Michigan Department of Environmental Quality (DEQ) and EPA Region V in Chicago are responsible for ensuring that public water systems comply with National Primary Drinking Water Regulations for lead. States are responsible for assisting schools and day care facilities in implementing lead in drinking water control programs.

Drinking Water Community: Public water systems comprise the regulated drinking water community and they have responsibility for complying with National and State drinking water standards for lead. They ensure that the water they deliver is non-corrosive, contains regulated levels of lead, and will not result in significant levels of lead leaching from plumbing.

**Local Community:** The local community includes those who would be most affected by lead in drinking water risks. Members of the local community should be the primary target of any general communication activities.

**Larger Community:** The local and regional media can serve as a conduit for information reaching a larger local community. Your spokesperson should be prepared to respond to interview requests with accurate and consistent information.

#### Timing

The timing of communication activities can reduce complications and conflict if those potentially affected are notified in advance of important issues and events. At the very least, you should provide information at the following times: before the sampling program begins, in response to public interest, and after results of testing are obtained and when decisions on corrective actions are being made. This notification should take place within thirty days from receipt of test results from the laboratory.

#### Contents of the Message

Your message should contain the following: details about the nature of your lead control program, results of sampling and plans for correcting problems, information on public health effects and risks posed by lead in drinking water and the existence of lead in drinking water resources.

#### Methods of Communicating

The methods should be consistent with your communication strategy. Additional ideas may include: Create an information center in your facility, develop a task force and include members of your facility's community and encourage classroom activities that focus on drinking water quality.

#### Communication Tips

- Take the initiative in providing information to your community. When children and health risks are involved be concise, consistent and correct in the information you present.
- Be certain that the information you provide is accurate, comprehensive and true. Be a credible source of information.
- Ensure consistency of message by having one spokesperson.
- Anticipate types of questions and realize that members of various constituencies (e.g. teachers, employees, parents, and students) will have different concerns.
- Be positive, proactive and forthcoming when dealing with media. Work together in a cordial manner and your communication efforts will likely be less complex.
- Keep members of the faculty and other employees up-to-date on events and share information as the program develops.



## - The Action Plan -

- **Testing in Flint public schools immediately to ensure that drinking water is safe**, with testing also available at no cost to any other school in Flint.
- **Offering free water testing** to Flint residents to assure their drinking water is safe.
- **Providing free water filters** to residents with concerns or who are included in state assistance programs.
- **Expanding health exposure testing** of individual homes.
- **Accelerating corrosion controls** in the Flint drinking water system.
- **Accelerating water system improvements** to address replacing lead service lines.
- **Expediting the completion of the Karegnondi Water Authority pipeline.**
- **Expanding a Safe Drinking Water Technical Advisory Committee** to ensure the best technology, practices and science are being followed by adding an expert from the Environmental Protection Agency's Office of Research and Development to the group.
- **Naming Dr. Eden Wells**, chief medical executive for the Michigan Department of Health and Human Services, as the **Flint drinking water public health adviser.**
- **Boosting a comprehensive lead education program** to make sure residents have detailed information about how to protect themselves and their homes.

To get your water tested for free, please call the city of Flint Water Plant at (810) 787-6537 and then press 1.  
You can also email [flintwater@cityofflint.com](mailto:flintwater@cityofflint.com)

Visit [www.mi.gov/FlintWater](http://www.mi.gov/FlintWater) for more information



# TAKING ACTION ON FLINT WATER

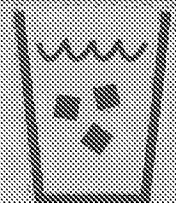
[www.mi.gov/FlintWater](http://www.mi.gov/FlintWater)

## - Tips for Flint Residents -

Lead plumbing is common in homes built prior to 1986, and anyone in the state with lead pipes in their home can take some extra precautions to minimize lead in their drinking water.

1.

Get your water tested for lead. Flint residents can get their water tested for free. To get your water tested, please call the Flint Water Plant at (810) 787-6537 and then press 1.



2.

To ensure safe drinking water, you can also get a free filter. Please visit [mi.gov/FlintWater](http://mi.gov/FlintWater) to find where you can get a free filter.

3.

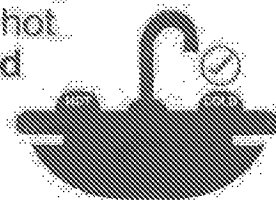
It takes time for lead to get into your water. After the water has been sitting in your pipes for several hours, it can pick up lead from the pipes. To reduce lead in your water, flush your pipes for 30 seconds.

When you first turn on the water in the morning, or after you have not used the water for several hours, the water may contain more lead. To reduce lead in your water, flush your pipes for 30 seconds.

Do not drink the water for 30 seconds after you have not used the water for 8 hours.

4.

Additionally, more lead gets into hot water than cold water. Use only cold water for drinking, cooking and making baby formula.



To get your water tested for free, please call the city of Flint Water Plant at (810) 787-6537 and then press 1. You can also email [flintwater@cityofflint.com](mailto:flintwater@cityofflint.com).

Visit [www.mi.gov/FlintWater](http://www.mi.gov/FlintWater) for more information





## ***Michigan Department of Environmental Quality News Release***

Oct. 2, 2015

For More Information:

?

### **Michigan leaders announce Snyder's action plan for Flint drinking water**

Local, state and federal leaders today announced Gov. Rick Snyder's action plan for drinking water in Flint, designed to address both the short- and long-term needs of residents.

The action plan focuses on increasing water testing, offering additional precautions for families with lead plumbing in their homes, and providing long-term solutions to address the city's water infrastructure.

"We are deeply concerned by the lead results we are seeing in parts of Flint," Snyder said. "Although we know the water leaving Flint's drinking water system is safe to drink, some families with lead plumbing on their property experience higher levels of lead in the water that comes out of their faucets. We are concerned for those families, and we created this action plan to address their immediate needs as well as the long-term needs of all Flint residents."

As the city and state work through gathering additional data, they will provide the following additional precautions so residents to continue to use their drinking water:

- **Gov. Rick Snyder names Dr. Eden Wells as the Flint Drinking Water Public Health Advisor.**
- **Provide water filters to residents of Flint.**
- **Continue to disseminate advisories recommending residents flush their cold water pipes before use, as well as use only water from the cold water tap for drinking, cooking and especially for making baby formula.**

The city and the state also are working together to gather more data to ensure the water that leaves the treatment plant as well as the water that arrives in Flint homes is safe for all residents. To increase knowledge about the city's system, the plan includes:

- **Immediately test Flint public schools to ensure that drinking water is safe.**  
**Testing also will be available at no cost to any other school in Flint.**
- **Expand health exposure testing of individual residences.**
- **Offer water testing at no cost to Flint residents to assure water is safe.**
- **Fully optimize corrosion controls in the Flint drinking water system by Nov. 1, 2015.**
- **Convene the city's safe drinking water "Technical Advisory Committee" to ensure the best technology, practices and science are being utilized, and add an expert from the EPA's Office of Research and Development to the group.**

The federal, state and local governments also are working together on long-term solutions, including:

- **Accelerate water system improvements to address replacement of lead service lines.**
- **Expedite completion of Karegnondi Water Authority.**

Local, state and federal leaders announced the plan at a press conference today at Kettering University's Innovation Center in Flint. Participants included:

- Harvey Hollins, Director of Snyder's Office of Urban Initiatives
- Dan Wyant, Director of the Michigan Department of Environmental Quality
- Nick Lyon, Director for the Michigan Department of Health and Human Services
- Dr. Eden Wells, Flint Drinking Water Public Health Adviser
- Dayne Walling, Mayor of Flint
- Susan Hedman, Region 5 Administrator for the U.S. Environmental Protection Agency
- Name, Title for the Genesee County Health Department

"This action plan offers concrete steps we will take in a local, state and federal partnership to ensure all Flint residents have safe water to drink," Wyant said. "The DEQ will work closely with the city to gather further data to ensure the water that leaves Flint's system as well as the water that arrives in Flint homes is safe to drink."

For more information, visit [www.michigan.gov/flintwater](http://www.michigan.gov/flintwater).



## **Frequently Asked Questions: Water Lead Levels in the City of Flint September 2015**

### **How can lead get into drinking water?**

Lead detections in Flint drinking water exist at the home level. Sampling at the Flint Water Treatment Plant has shown no lead in its treated water. However, this contaminant leaches into water from a home's lead service lines, lead solder, and leaded plumbing materials including fixtures, faucets, and fittings.

### **Does the city meet federal drinking water standards for lead and copper?**

Yes, the city is meeting state and federal guidelines for lead and copper.

The City of Flint has regularly monitored for lead and copper since federal law began requiring it in 1991.

When the City changed water sources in May 2014, state and federal law required the city to sample for lead and copper for a full year to determine how the water may be interacting with residential lead plumbing to increase lead levels. While the city's results show residential lead levels below the federal threshold for immediate response activities, Flint is moving quickly to optimize corrosion control measures in its water system.

### **Some individual homes showed high numbers for lead. Isn't that a concern?**

For the homeowner, yes it is. There is no "safe" level for lead, and while the leading cause of lead poisoning around the country is lead paint, any source of lead ingestion is worthy of concern.

But the State and federal guidelines for lead and copper acknowledge an important reality: Any home that has a lead service connection or lead plumbing will impart some varying amount of lead into the home's water. The only way to eliminate lead in a home water system is to remove lead plumbing or replace lead service connections to the city system.

The lead and copper rule requires the local operator to sample dozens, sometimes hundreds of homes in the service area to get a general sense of how the water supply is interacting with lead plumbing and service connections. The tests are done specifically at homes with lead service connections. Individual results vary and all participants are

### **Are there other ways the city monitors for lead exposure?**

The County Health Department, overseen statewide by the Michigan Department of Health and Human Services, regularly monitors blood levels in children throughout Michigan communities. The leading cause of lead poisoning is exposure to lead paint.

Blood lead level testing results for the 12-month period just after the City of Flint changed its water source (May 2014 – April 2015) showed no significant change in the pattern of blood lead levels in Flint, compared to the previous three years. This data suggests the recent change in water source by the City of Flint has not contributed to an increase in lead exposure throughout the community.

### **How does the state decide if the water is creating a lead problem?**

Compliance with the federal lead rule is based on a 90<sup>th</sup> percentile calculation. If more than 10 percent of samples report lead above the federal action level of **15 parts per billion**, a water supply has an "action level exceedance." An exceedance is not a violation. It triggers other requirements which could include public notification, additional water quality sampling, and possibly further treatment.

While some of Flint's individual samples exceeded the 15 parts-per-billion lead action level, compliance is based on **the 90<sup>th</sup> percentile of samples**. The City of Flint's 90<sup>th</sup> percentile level has ranged between 0 parts per billion in 2008 and 2011, and 15 parts per billion in 1992, but never exceeded the action level.

The two most recent sampling periods, in 2014 and 2015, were 6 parts per billion and 11 parts per billion, respectively.

### **Did the city use every sample they got back?**

Sampling requirements for lead and copper are designed to target the most common pathways to lead ingestion in homes with the least protection. The sample must be collected from a commonly used kitchen or bathroom tap, and in accordance with the provided sampling instructions. Homes that employ filtration or additional treatment cannot be included. Samples must also be collected within the established monitoring period.

### **I have a lead service connection or lead plumbing. What should I do?**

Replacement is the only way to eliminate lead exposure. However, here are some interim steps homeowners can take to reduce it:

Flush pipes before drinking, and only use cold water for consumption.

The more time water has been sitting in your home's pipes, the more lead it may contain. When water in a particular faucet has not been used for six hours or longer, "flush" cold-water pipes by running the water until it becomes as cold as it will get. This could take five to 30 seconds if there has been recent water use elsewhere in the home, such as showering or flushing toilets. Otherwise, it could take two minutes or longer.

Use only water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead.

**Who is responsible for replacement of lead materials?**

Replacement of service pipes on private property and any leaded plumbing materials within the home is a **homeowner's responsibility**. The City of Flint owns the service pipe from the water main to the curb stop valve, and that is **the City's responsibility**. This valve is normally located two feet in from the street curb. From there to the house is private property and the responsibility of the homeowner.

**Why doesn't the city at least replace its portion of lead service lines?**

Partial lead service line replacement has been shown to mobilize more lead and make the situation worse. Only full lead service line replacement has been demonstrated effective in achieving long-term reductions in drinking water lead levels.

**What is the City's timeline for installation of corrosion control treatment?**

The federal government allows the steps to complete the installation of optimal corrosion control treatment and follow-up monitoring to take up to five years.

However, the City of Flint has committed to completing installation of Optimized Corrosion Control Treatment in **less than six months**.

**What will happen when Flint joins the Karegnondi Water Authority next year?**

The City has committed to having Optimized Corrosion Control Treatment in place prior to its connection with the Karegnondi Water Authority (KWA). The water provided by KWA will come from a new source, Lake Huron. The city will continue its lead and copper sampling every six months. Additionally, the city's water treatment plant will continue to operate with uninterrupted Optimized Corrosion Control Treatment.

**How long would it take to replace lead service lines throughout Flint?**

The city has about 32,900 service connections in total. **More than 15,000** of these connections are considered lead service lines. Even if many crews were contracted, it would likely take up to 15 years to complete this work.

**What would it cost to replace the lead service line at my house?**

Average costs to replace a lead service line at an individual home range from \$2,000 to \$8,000. Costs vary depending on the length and size of service line that is needed, as well as the ground cover and soil conditions encountered.

With more than 15,000 lead service lines at an estimated average cost of \$4,000 for each replacement, total cost could be **\$60 million or more**.

# DRINKING WATER - LEAD - DISTRIBUTION OF RESPONSIBILITIES

| Environmental Protection Agency   | Michigan Department of Environmental Quality  |
|---|---|
| <ol style="list-style-type: none"> <li>1. Promulgation of Federal Safe Drinking Water Act Rules</li> <li>2. 1974 Safe Drinking Water Act                             <ul style="list-style-type: none"> <li>- 1991 Lead and Copper Rule</li> <li>- 2000 Lead and Copper Rule Minor Revisions</li> <li>- 2007 Lead and Copper Rule Short Term Revisions</li> <li>- 2017 Lead and Copper Rule Long Term Revisions</li> </ul> </li> <li>3. Granting Primacy of Federal Regulations to States</li> <li>4. Auditing of State Public Water Supply Programs</li> <li>5. Provide Funding to States</li> </ol>   | <ol style="list-style-type: none"> <li>1. Primacy - Michigan Safe Drinking Water Act and Administrative Rules</li> <li>2. Oversight of public water systems</li> <li>3. Inspections</li> <li>4. Construction Permitting</li> <li>5. Provide loans to water systems for public infrastructure improvements</li> <li>6. State Laboratory Services</li> <li>7. Laboratory Certification</li> <li>8. Establish monitoring requirements, quantity and frequency</li> <li>9. Verification of monitoring results and compliance determination</li> <li>10. Notify water systems of Action Level Exceedance</li> <li>11. Establish Water Quality Parameter Ranges, as necessary</li> <li>12. State Reporting to EPA</li> <li>13. Operator Training and Certification</li> </ol> |
| City of Flint Water Customers   | Water Customers   |
| <ol style="list-style-type: none"> <li>1. Certified Operation of public water system</li> <li>2. Establish Water Rates</li> <li>3. Obtain construction permits</li> <li>4. Reporting to MDEQ</li> <li>5. Coordination of lead and copper sampling                             <ul style="list-style-type: none"> <li>- Establishing a Tiered Sampling Pool</li> <li>- Providing Sampling Kits and Instructions to customers</li> <li>- Obtain signed statements from participating customers</li> <li>- Obtain sample analysis</li> <li>- Provide individual lead sample result to participants</li> <li>- Comply with Action Levels for lead and copper</li> <li>- Provide lead monitoring and notice Certification to MDEQ</li> </ul> </li> <li>6. Provide Annual Report (CCR) to all customers</li> <li>7. Conduct Water Quality Parameter Monitoring</li> <li>8. Recommend and Install Optimized Corrosion Control Treatment</li> <li>9. Provide Public Notification, as necessary</li> <li>10. Replace public portion of lead service, as necessary</li> </ol> | <ol style="list-style-type: none"> <li>1. Participate in lead sampling as requested</li> <li>2. Request lead testing if concerned</li> <li>3. Follow lead sampling Instructions</li> <li>4. Provide signed information on how sample was collected</li> <li>5. Review individual result material</li> <li>6. Follow instructions for reducing lead exposure</li> <li>7. Replace private leaded service line and plumbing materials with lead-free products</li> <li>8. Obtain plumbing permits and comply with code requirements</li> <li>9. Pay Water Bills</li> <li>10. Read Annual Report (CCR)</li> <li>11. Read and follow Public Notification materials</li> </ol>  |



Bill White, Matt Foundation

↳ 3rd Party Validation

Office of Linson Fanklin

Paranoia + Mistrust

Foundation Office

Matt

Food Stamp Cost Issue  
Utility Costs

Talking Points

- Service Area (City \$100,000)
- Inventory 70% Cost Iron (Most > 70% red) (Road & Sewer Tree In)
- Asset Management (Ann Arbor Trip)
- Water Loss / Accountability
- Water Affordability / Conservation
- Lead Reduction (New "Lead Free" Definition)
- System Age Infrastructure Replacement
- Communication w/ customers (confidence)
- Blight Demolition Issues / Vandalism Issues
- Cross Connection Protection
- Marketing Water Resources for Economic Development
- Preparation for KWA connection
- Electrical Efficiency / Conservation
- TTRM Home POU Filters (Maintenance Log Tom)
- Meter Replacement (2/10/13 Testing?)
- Major Customer Table from RS
- Lead Policy Improved

Toilets  
Shower heads  
Faucets

2008 (31.58)



2x

in 2009

Precedent  
BWA

① - 2 days

② - 3 days

3/2013 → Eng. Proposal

ACO  
line sludge  
facility

3/2014

Cont. Permit 4/2014  
late April 2014 - 4/25

# History of Flint Transition

April 2013 Mtg. w/ Governor to allow Flint to  
~~stop~~ terminate service from DWSB and connect  
to KWA (future)

June 2013 KWA Groundbreaking

4/2014 WTP  
Permit

1 8:00 collect  
2 8:00 collect  
↓  
med

24 hrs report + address

72 hrs 3 days

- WM - 70% Cat. I on
- Most > 20 yrs old
- 4" - 72" pipe
- 7250 Values

$$\frac{752}{748} \times \frac{748}{1000}$$

Rate Schedule  
Residential

\$7.52/100 gal (2600 gal)  
 \$7.52/748 gallons  
 \$10.05/100 gal = \$0.01/gallon  
 \$7.92/100 gal + \$2.90/month

See SLT

\$0.59/100 gal \$0.0105/gal

Aug Est. 6000 gal/month  
 7000 gal/month

## Gov Briefing 1st Item

- Soil Water Advisory  
↳ Source

## Old System in Decline

- Age
- Flow
- Better Minimized
- Contractors
- Water Usage
- 

## Status of Dist BWA 1.5 pgs Mex

### Process for SWA

Federal TC MCL Std 73/76

Adapted by MI 91' Revision

Public Notice

↳ breaks out

creating break

- Overage/Loss of Pressure

Tap later Online

Library



## History

- KWA + River
- Potential for reoccurrence

Next Week

Tues.

AWVA

---

## Summary

DEQ

- Ensure Safe DW
- Proactive OEL
- Engage Local Assistance

August Acute Violation

Sept. TC MCL Violation? Likely

↳ Data Due by 10/10 if VN will have 30 days  
to PN after Notification  
issue

Std. based on  
age of all  
monthly samples

# Flint Drinking Water

## Media Q&A

### **Is the city going back to DWSD?**

That's something we're leaving open. It's certainly an option, but there are no moves at this time to do so. If it becomes something city leadership is interested in doing, the state is willing to act as a facilitator between Flint and DWSD to help come to conclusion that's best for the residents of Flint.

### **How did the state not see this problem sooner?**

Right now, we're focusing on addressing the problem at hand. Every household in the city of Flint is going to receive a water filter. The Flint Water Treatment Plant is going to fully optimize its corrosion controls by Nov. 1. And we're going to accelerate water system improvements to address the replacement of lead service lines.

In the long term, we will work with the U.S. EPA to look at water testing protocol.

### **Is the water safe?**

The water leaving the Flint Water Treatment Plant is safe to drink and meets federal guidelines for lead. However, we recognize some residents experience higher levels of lead in the water that comes out of their faucets because of lead plumbing in the home. We will expand water testing to better determine which areas have a problem; however, in the meantime, every home will receive a filter to ensure their drinking water is safe.

### **Does this mean Marc Edwards was right?**

We aren't familiar with his testing protocol and have not seen his data. All we know is the state's data and the data Hurley Medical Center provided indicate a need to take action.

### **Why didn't you require corrosion controls from day one?**

When the city switched water sources, they did begin using lime softening as a corrosion control. DWSD used phosphates, which is another form of corrosion control, but far from the only one. Flint was within federal protocols when it chose to use lime, and this is consistent with what every other community was required to do.

With more data in hand, the city can now work to optimize their corrosion control system, and has pledged to do so by Nov. 1.

## Busch, Stephen (DEQ)

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 17, 2015 2:02 PM  
**To:** Howard Croft (hcroft@cityofflint.com); Brent Wright (bwright@cityofflint.com); mglasgow@cityofflint.com; Daugherty Johnson (djohnson@cityofflint.com)  
**Cc:** Gerald Ambrose (gambrose@cityofflint.com); 'nhenderson@cityofflint.com'; prysbym@michigan.gov  
**Subject:** Water Quality Optimization Strategy

Howard,

As Mike Prysby and I mentioned during our phone call earlier today, the City should be taking action to optimize water quality in the City's distribution system which will in turn provide the City's water customers with water quality that helps limit the potential for legionella occurrence in premise plumbing. It is recognized that contraction of Legionnaires' Disease is not from ingestion of potable water and not regulated under Safe Drinking Water Act requirements. Further, there is currently no direct evidence of legionella in the City's public water system. However, actions by the City of Flint water system can help minimize the potential for an outbreak in customer plumbing systems.

These actions include the following:

- Water main pigging and flushing to remove biofilm, tuberculation, and sediment throughout the distribution system. Failure to remove such material will limit the effectiveness of any disinfectant. Pigging is the preferred process and equipment can be obtained at minimal cost. As the growth range for legionella starts at 68 degrees F, conducting this work as soon as possible in the spring and early summer with cooler temperatures would help reduce the potential for formation under warmer water conditions.
- Maintain pH levels of 7.2-7.8 in finished water and distribution system when possible to maximize the disinfection and oxidation potential of the hypochlorous acid residual (versus the less potent hypochlorite ion). Any optimized corrosion control plan practices regarding pH levels must be taken into consideration.
- Maintain a minimum free chlorine residual of 0.5 mg/L throughout the distribution system when possible. Continuous residual at this level has been shown to be effective in control of legionella. (This will need to be balanced with requirements to limit TTHM formation and comply with the TTHM standard.)
- Continuous operation and optimization of the ozone treatment equipment to treat raw source water. Ozone is highly effective in the destruction of legionella bacteria.
- Conduct routine monitoring for legionella bacteria at the water treatment plant tap and at locations in the distribution system. Note: sample locations must take water directly off the main and not be from premise plumbing systems. Distribution locations could include storage tank inlets or pumping stations. Monitoring at the WTP plant tap would demonstrate removal of any legionella present in raw source water. A private laboratory that specializes in water sample analysis for legionella would need to be used.
- Optimize water treatment plant operation for pathogen reduction under surface water treatment rule requirements. Optimizing the removal for similar pathogens can help reduce the potential for legionella.

A conference call with City staff would probably be best to facilitate further discussions of these actions in more detail. Mike and I can make ourselves available this week to discuss and answer any questions.



Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

## 2.11 Water Distribution System Master Metering – Genesee County

Genesee County is the city's largest customer and takes water off the 72" pipeline at a number of locations and has the ability to take water from the Flint distribution system. The following Table shows the 2008 Genesee County metered flows.

**Table 4: Water Distribution System Master Metering – Genesee County**

| Meter Location       | Meter Size | 2008 AAPP (MG) |
|----------------------|------------|----------------|
| West Carpenter       | 6"         | Inactive       |
| G3000 Flushing Road  | 6"         | Inactive       |
| G3348 Flushing Road  | 6"         | 0.101          |
| G3167 West Pierson   | 6"         | Inactive       |
| G3376 North Genesee  | 10"        | Inactive       |
| Kearsley Circle      | 24"        | 4.292          |
| Potter and Belsay    | 10"        | 2.032          |
| Potter and Irish     | 10"        | 2.055          |
| Oak and Potter       | 10"        | 0.412          |
| Henderson and Potter | 36"        | 4.126          |
| M-15 and Potter      | 10"        | 0.134          |
| Total                |            | 13.153         |

Source: City of Flint

## 2.12 Unaccounted for Water Use

The difference between the quantity of water supplied to the City of Flint and the quantity sold to customers is referred to as unaccounted for water. Water in a public system can be unaccounted for due to a number of reasons. Water withdrawn from a fire hydrant, whether it is to fight a fire or flush a water main is un-metered and therefore unaccounted for. Leaks and water main breaks, faulty or inaccurate meters, unauthorized connections and un-metered municipal water use also contribute to unaccounted for water.

Water system efficiency analysis indicates that the City of Flint system is at 68.41%. This indicates that the city has significant leaks, inaccurate meters and/or illegal connections to the system. A high priority should be placed on implementing a program to reduce the unaccounted for water. The program should include: testing high volume meters, leak detection analysis, residential meter replacement, billing system review, and fire flow estimates. Table 5 below shows unaccounted for water calculations.

4/3/2014

Flint

- per Flint 72" remain available until KWA  
DWSO has penalties  
No DWSO standby contract will be signed

- Gen. Co. Interconnects

↓  
Drain Feed

↓  
Working on Generator

Finished 57 → 37 MG

Aug. 12-13 MG) ≈ 25-3 hrs

↓  
- City Holloway under Low Flow / Min Depth  
30+ MG)  
Max Day ≈ 18 MG)

Mtg w/ Flint

City of Flint

- Howard Craft

- Daugherty Johnson

- Samir Motta

- Steve Busch

- Mike Pryor

- Jim Ardoin

Jim Ardoin

Physical Separation

Sheet Pile

- Concerns - longevity

- Removal Stability

- Existing Lime Possibly not stable

Me - Physical Separation goes down to natural soil

Samir Removal Stability - Backfill as removal occurs  
corrosion

Existing pH  $\approx$  8  
Sludge

~~Heard from~~

Jim

- City still needs options to:

- disposal

- cap in place

Dwayne R. determines merit

If Inert still need physical separation  
for WTP Residual Open.

Daughtry is lead for ACO for City of Flint  
Utilities Dept

Proposed Capacity 3-4 Months

↳ 50,000 yd<sup>3</sup> generated  
3% solids

- 2 ft freeboard

↳ provided above max. level

2/19 Plans were finalized

↳ comments provided

↳ Plans Revised

3 phase system original design

not available single phase only for pump station

Sheet piling ~~comment on~~

Is deep enough to provide stability for  
waste disposal  
on backside of line sludge lagoon



## - Operations

OIC - Glasgow F-1  
Brent F-2 going F-1  
F-3  
F-4 → Now

## - Contracts Signed

Existing Pump to be used until new pump in fall  
7, 8, 9, ok

no operational interruption

## - Mid point prior to start up

- Storage - scheduling early PDs → Auto Detect Order System?  
↳ contract w/ 2 day response
- ✓ Electrical by Startup Consumers Contractor has components
- ✓ Mil Pt. by Startup
- ✓ P54 use til fall

April 17 startup goal but not  
 ← because of any forced rate  
 - Having the plant ready is primary driver  
 Won't start w/out softening City

Once ~~Wait to have~~ everything is in place they will start

WTP Application

Both Apps

Have final → Apps  
 ↳ Mike Final Review  
 - Comments or Clean JTS  
 ↳ other Review ↳ Mike/Steve Issue  
 Possibly by tomorrow

Email out Schedule

Anticipated Startup in the near future

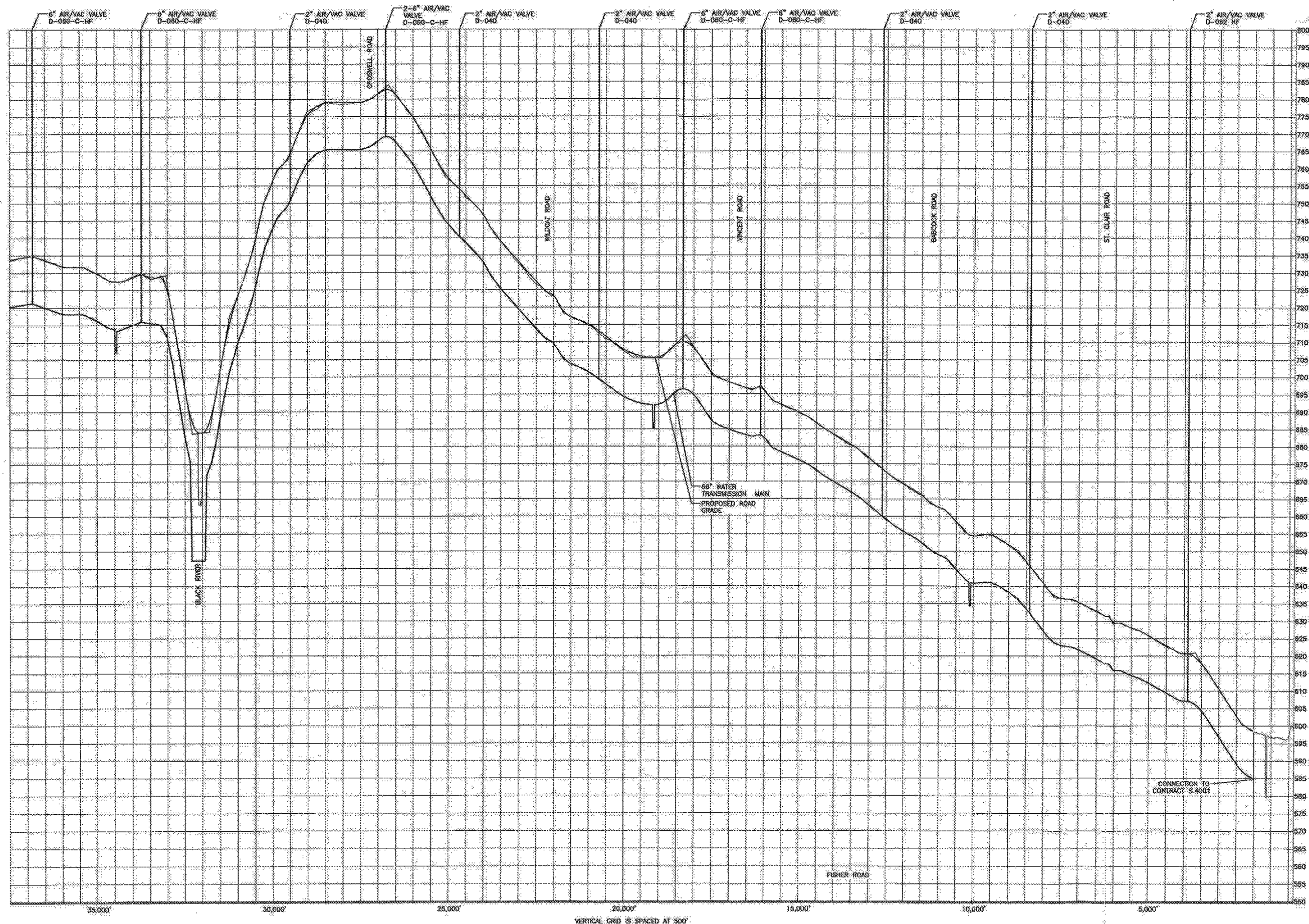
Sludge Management Plan Need Final Copy

↳ Received Draft Today

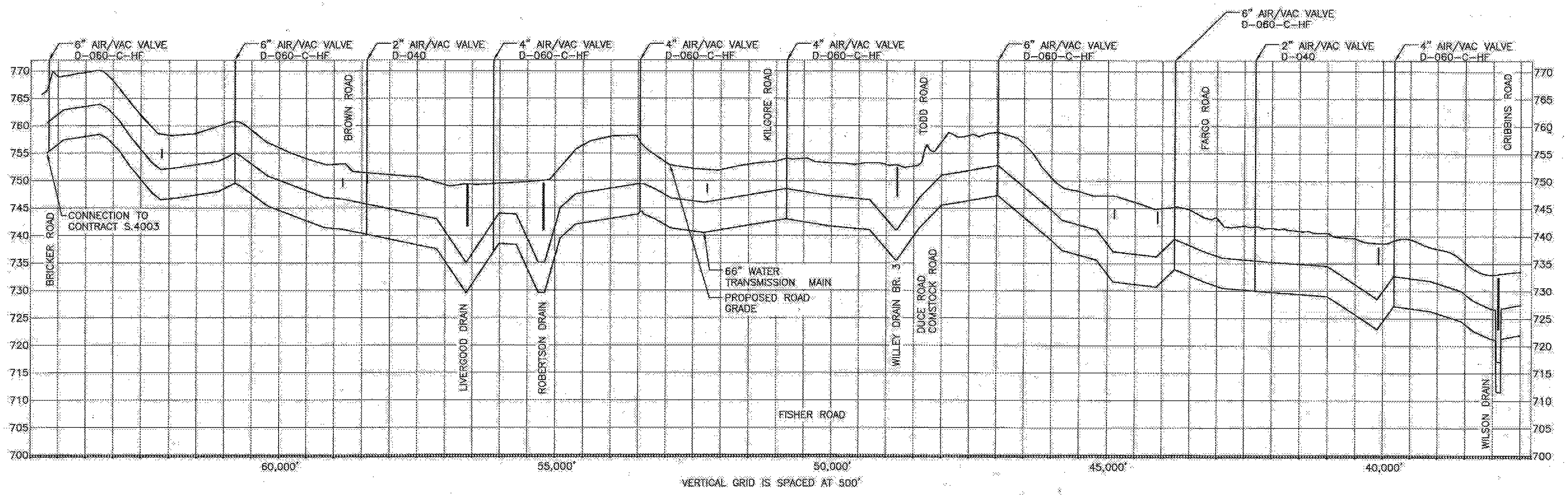
Go over comments internal w/ Mike  
prior to sending



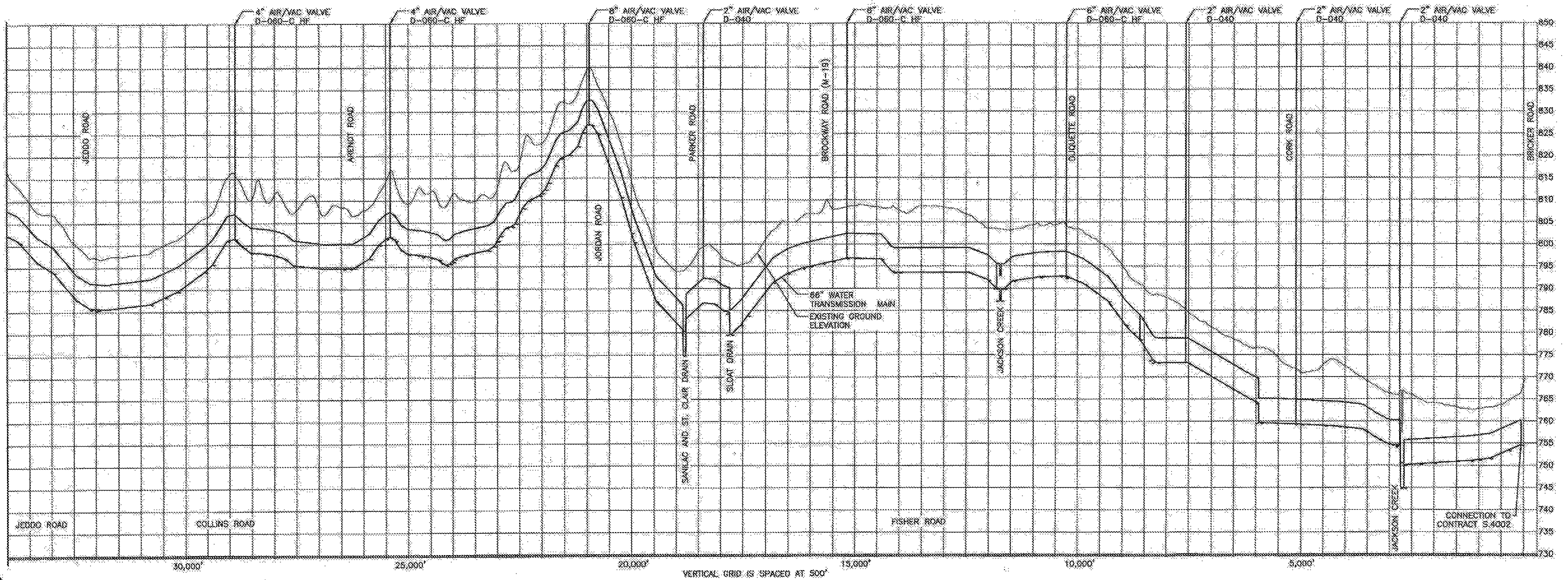
CONTRACT S.4002  
SHT. 1 OF 2



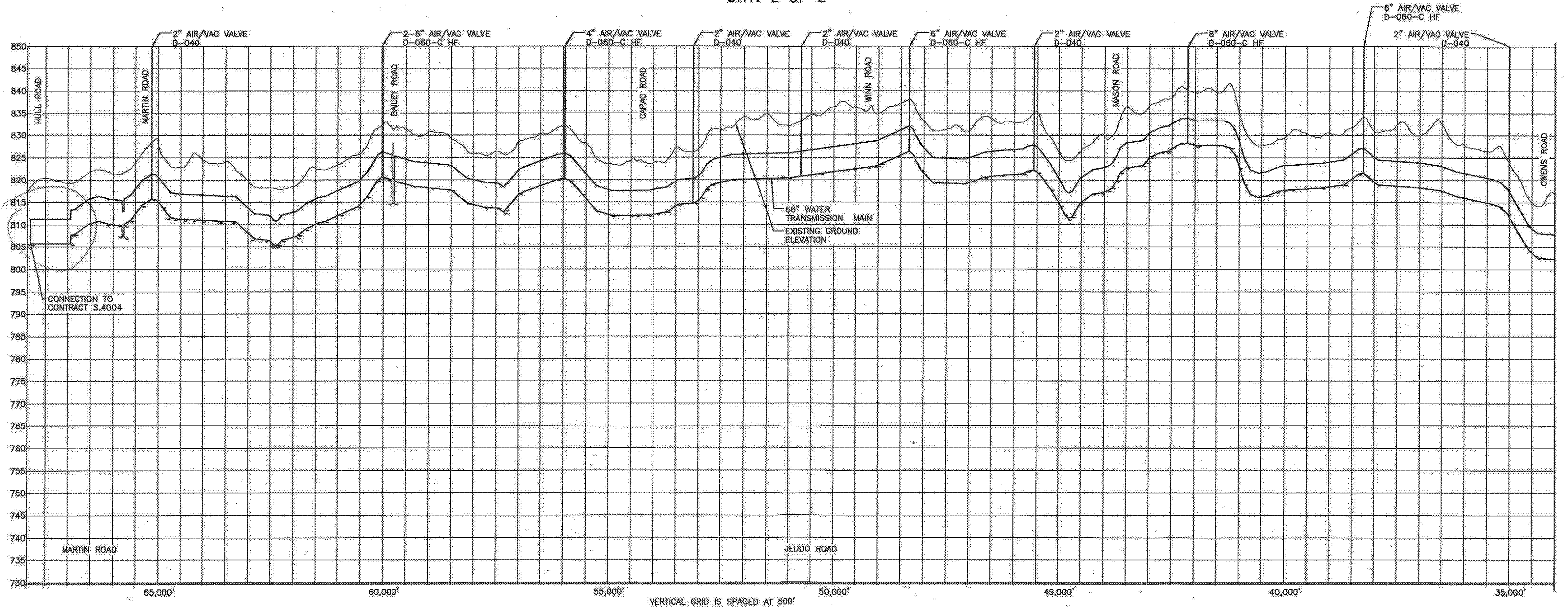
CONTRACT S.4002  
SHT. 2 OF 2



CONTRACT S.4003  
SHT. 1 OF 2

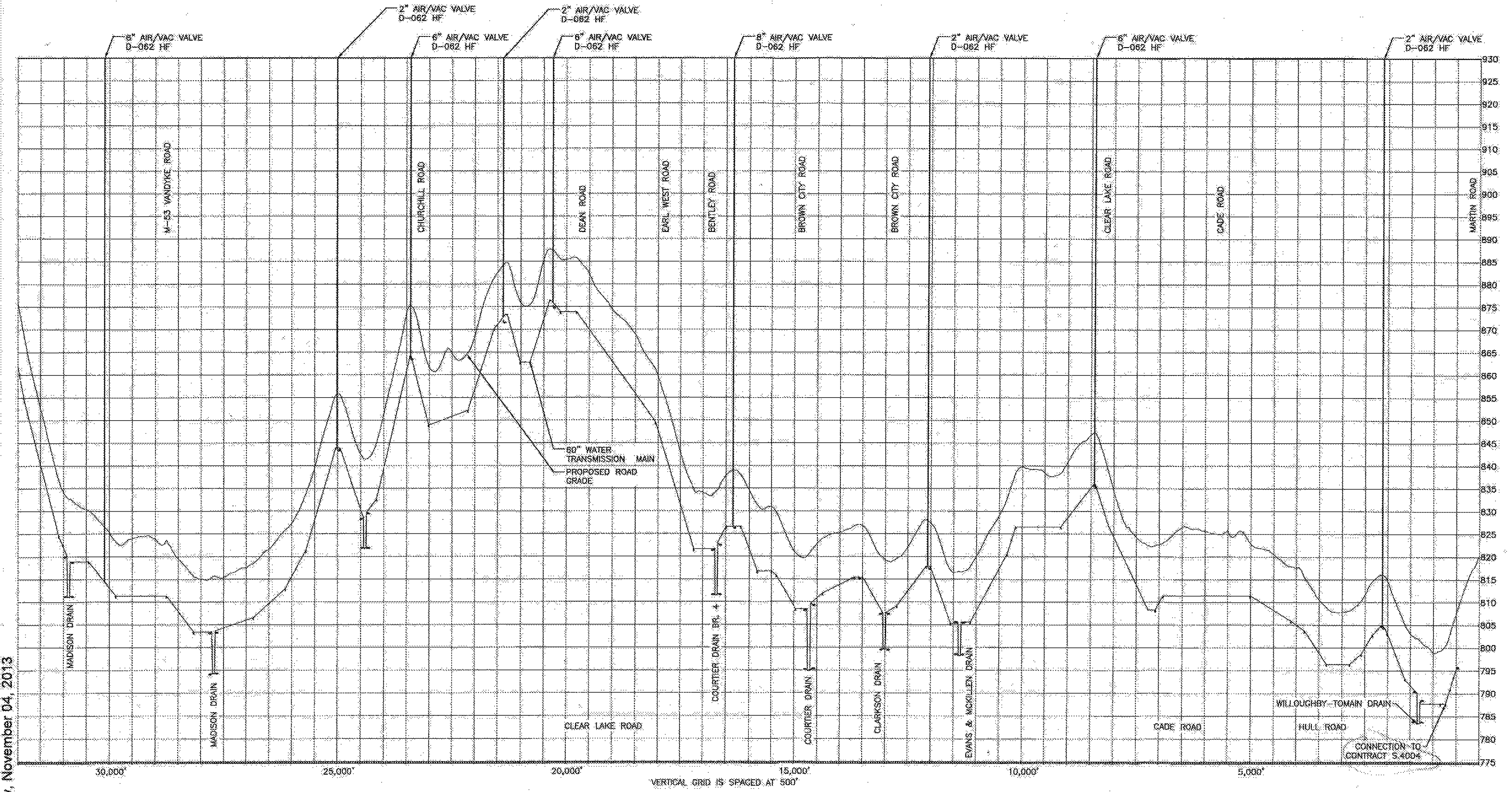


CONTRACT S.4003  
SHT. 2 OF 2

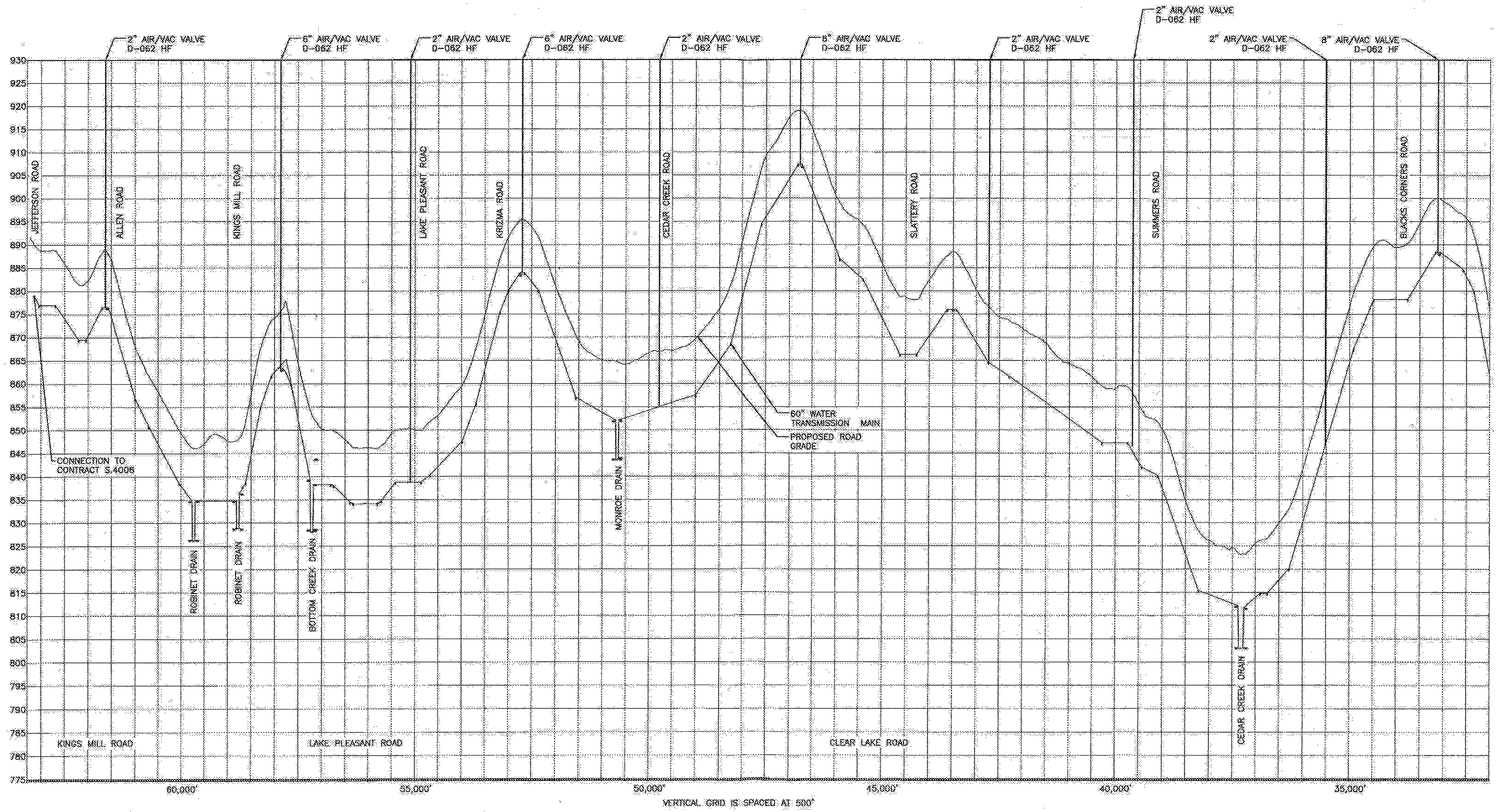


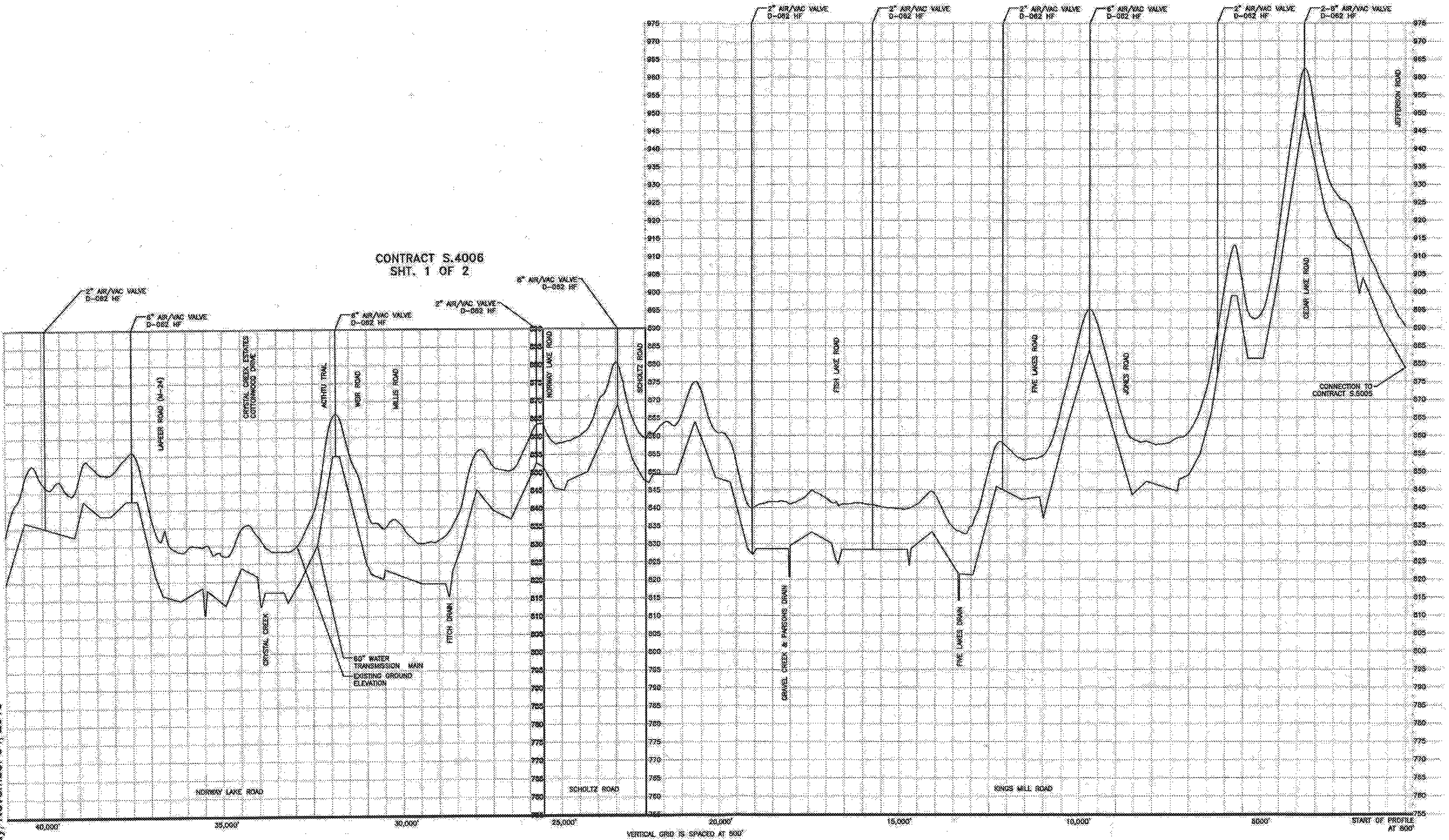


CONTRACT S.4005  
SHT. 1 OF 2



CONTRACT S.4005  
SHT. 2 OF 2

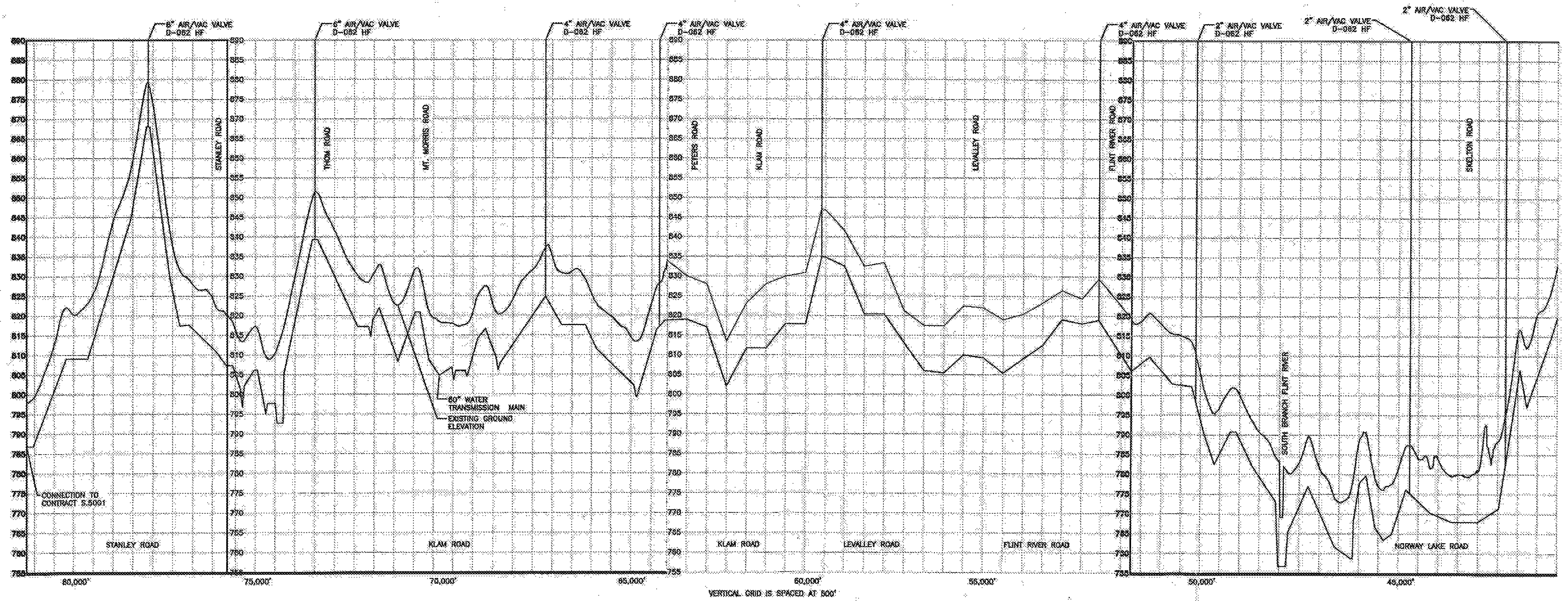




VERTICAL GRID IS SPACED AT 500'



CONTRACT S.4006  
SHT. 2 OF 2







UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF WATER

NOV 03 2015

**MEMORANDUM**

**SUBJECT:** Lead and Copper Rule Requirements for Optimal Corrosion Control Treatment for Large Drinking Water Systems

**FROM:** Peter C. Grevatt, Director  
Office of Ground Water and Drinking Water

A handwritten signature in black ink, appearing to read "P.C. Grevatt", is written over the "FROM:" line.

**TO:** EPA Regional Water Division Directors, Regions I-X

This memorandum addresses certain concerns raised about the application of the 1991 Lead and Copper Rule, specifically the requirements pertaining to maintenance of optimal corrosion control treatment, in situations in which a large water system ceases to purchase treated water and switches to a new drinking water source. These concerns have been raised most recently in regard to the drinking water system in Flint, Michigan, where the water system was disconnected from the Detroit Water and Sewerage Department, which provided corrosion control treatment for Lake Huron source waters, and instead began distributing water from the Flint River. This type of situation rarely arises and the language of the LCR does not specifically discuss such circumstances. After reviewing the rule with our Office of General Counsel, it appears that there are differing possible interpretations of the LCR with respect to how the rule's optimal corrosion control treatment procedures apply to this situation, which may have led to some uncertainty with respect to the Flint water system. This memorandum clarifies how the LCR applies to this situation and eliminates the uncertainty for water systems and primacy agencies that may face these circumstances in the future.

It is important for large systems and primacy agencies<sup>1</sup> to take the steps necessary to ensure that appropriate corrosion control treatment is maintained at all times, thus ensuring that public health is protected. This memorandum focuses on those steps and clarifies, on a prospective basis, how EPA interprets the LCR corrosion control requirements and how primacy agencies should apply these requirements to large public water systems before, during and after making a significant change in source water, including switching from purchased water to a new source.

Under the LCR, all large systems (those serving more than 50,000 persons), whether purchasing water or not, must have completed a series of steps to either optimize the corrosion control treatment or be deemed to have optimal corrosion control treatment (OCCT) by 1998. 40 CFR 141.81. Key steps for

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<sup>1</sup> The term "primacy agency" refers to the State, tribe or U.S. Environmental Protection Agency regional office having jurisdiction over, and primary enforcement responsibility for, a given public water system.

optimizing corrosion control include monitoring, corrosion control studies, installation of treatment, follow-up sampling and specification by the primacy agency of water quality parameters (WQPs) for monitoring corrosion control. The LCR requires any large system that has met the OCCT requirements through the installation of corrosion control treatment to continue operating and maintaining the treatment and to continue meeting the WQPs established by the primacy agency. 40 CFR 141.81(b) and 141.82(g). Systems deemed to have OCCT without the installation of corrosion control treatment are not subject to this requirement. However, they are required to notify the primacy agency in writing of any upcoming changes in treatment or source and request that the primacy agency modify its determination of the OCCT and WQPs applicable to the system. The primacy agency must then review and approve the change and designate OCCT and WQPs prior to its implementation by the system. 141.81(b)(3). Similarly, systems subject to reduced monitoring or monitoring waivers must notify the primacy agency of any upcoming changes in treatment or source and the primacy agency must subsequently review and approve it. EPA recommends that systems that are not subject to a notification requirement also notify the primacy agency prior to the addition of a new source or treatment and request the primacy agency to modify its determination of the optimal corrosion control and WQPs applicable to the system.

Due to the unique characteristics of each PWS (e.g., source water, existing treatment processes, distribution system materials) it is critical that public water systems, in conjunction with their primacy agencies and, if necessary, outside technical consultants, evaluate and address potential impacts resulting from treatment and/or source water changes. It is also critical for public water systems to conduct ongoing monitoring to ensure compliance with OCCT prior to, during and after a source or treatment change. The rearrangement of a system's existing configuration may trigger the need for OCCT adjustments and establishment of appropriate WQPs. Primacy agencies should work with systems that plan to disconnect from a supplier that had installed corrosion control treatment to determine the OCCT for the new source and establish WQPs for that treatment instead of using the OCCT and WQPs established for the previous source. This will allow a system that ceases to purchase treated water to stay in compliance with any applicable requirements pertaining to OCCT and ensure protection of public health during and after the change in source. EPA has developed a guidance manual<sup>2</sup> specifically focusing on evaluation of corrosion control treatment options and optimization of full-scale treatment to assist water systems and primacy agencies with these efforts. EPA is currently preparing an updated version of the manual, which we anticipate will be released in February 2016.

The key to identifying and mitigating potential problems is to ensure effective collaboration between the public water system and the primacy agency. Corrosion control treatment can come in many forms. For this reason, it is important to conduct a system-wide assessment prior to any source water and/or treatment modifications and to identify existing or anticipated water quality, treatment or operational issues that may interfere with or limit the effectiveness of corrosion control treatment optimization or re-optimization.

If you have additional questions or concerns, please contact me or have your staff contact Maria Lopez Carbo, Chief of the Protection Branch, in the Office of Ground Water and Drinking Water, at [lopez-carbo.maria@epa.gov](mailto:lopez-carbo.maria@epa.gov).

---

<sup>2</sup> U.S. Environmental Protection Agency. *Lead and Copper Rule Guidance Manual, Volume II: Corrosion Control Treatment*. Office of Water. EPA 811-B-92-002. 1992. Available at: <http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=91019DM4.txt>.

Lansing District

Water Treatment Plants that Produce Lime Sludges

| County     | Plant                             | 1992 exemption?      | 2005 exemption?  | Self Declared (under Rule 114) | Regulated by MDAG | Current Options for lime sludges                    | Other Available Options for lime sludges   | Comments  |
|------------|-----------------------------------|----------------------|------------------|--------------------------------|-------------------|---|--|---|
| Gratiot    | Alma                              |                      |                  |                                |                   | Landfill  | - apply for 2005 generic AUA exemption<br>- apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD |   |
| Clinton    | NONE                              |                      |                  |                                |                   |   |  |   |
| Ingham     | LBWL                              | yes (1)<br>(invalid) | yes              | yes                            |                   | Landfill<br>land Reclamation*<br>Land Application** | - apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD   | * currently there are Issues with not following the designated prolime patented process.<br>** currently there are issues with offsite storage. |
|            | ELMWSA<br>(east lansing meridian) | yes (1)<br>(invalid) |                  | yes                            |                   | Landfill<br>land Reclamation*                       | - apply for 2005 generic AUA exemption<br>- apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD | * currently there are issues with not following the designated prolime patented process.  |
| Eaton      | NONE                              |                      |                  |                                |                   |   |  |   |
| Shlawassee | City of Owosso                    | yes (1)<br>(invalid) |                  |                                |                   | Landfill  | - apply for 2005 generic AUA exemption<br>- apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD |   |
| Livingston | City of Howell                    | yes (1)<br>(invalid) |                  |                                |                   | Landfill  | - apply for 2005 generic AUA exemption<br>- apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD |   |
|            | MHOG (Howell)                     |                      | yes<br>(expired) |                                |                   | Landfill  | - apply for 2005 generic AUA exemption<br>- apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD |   |
| Genesee    | City of Fenton                    |                      | yes<br>(expired) |                                |                   | Landfill  | - apply for 2005 generic AUA exemption<br>- apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD |   |
|            | Flint                             |                      |                  |                                |                   | Landfill  | - apply for site specific AUA exemption<br>- apply for other source separated or inertness exemptions under Part 115<br>- Work directly with MDARD   | because the ferric chloride sludge is mixed with the lime sludge, the generic AUA is not appropriate  |
| Lapeer     | NONE                              |                      |                  |                                |                   |   |  |   |

comments: 1) The 1992 Exemtions are no longer effective. They were invalidated by the 1995 amendments.



This map doesn't contain any items.

Notes

A rectangular box with a dotted border, intended for handwritten notes.

Beard Road  
Shiawassee Co.

Proline Site



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Prysby, Mike (DEQ)

From: Sygo, Jim (DEQ)  
Sent: Tuesday, December 01, 2015 9:06 AM  
To: Prysby, Mike (DEQ); Busch, Stephen (DEQ)  
Subject: Fwd: Questions About City Of Flint Water

Please propose a response for me

Sent from my iPhone

Begin forwarded message:

From: LeeWalters <lwalters313@gmail.com>  
Date: November 25, 2015 at 12:03:16 AM EST  
To: <SygoJ@michigan.gov>  
Subject: Questions About City Of Flint Water

Mr. Sygo

My name is LeeAnne Walters and I have a few questions about our water.

The first question what is the status of the pumps that are supposed to be installed for the ortho phosphates?

The second question is once the switch to the KWA happens, what will be the emergency water source for the City of Flint? Will it be Detroit or Flint River

Third question is a few months back Howard Croft confirmed a Y was installed at the water treatment plant to blend the untreated lake water with the Flint river water if needed. Will this still be happening/and or an option to happen.

I dont know if you are aware and I can provide pictures if you would like of the brown water that is coming out of people's taps because of the hydrant flushing. The city has been contacted multiple times and no answers have been given. Why are the people not being made aware of the flushing and contacted before it happens. Why is there no notification from the city or the MDEQ.

Respectfully  
LeeAnne Walters

1. Based on communication with the city of Flint, the P04 faced pumps were installed on 11/30. The pump controls are being interfaced with the ~~city's~~ water ~~plant's~~ control system. The P04 faced system is expected to be placed into operation at the end of this week or early next week.
2. The emergency water source for the City of Flint following the switch to the KWA  
The decision to utilize the Flint River or Detroit as the emergency water source for the city of Flint after the switch to the KWA will be made by the city of Flint.
- 3) →

3. The use of the interconnect to blend ~~raw water~~  
raw water from the KWA with raw water  
from the Flint River would be made by the  
City of Flint.

The interconnect structure installed at the WTP gives the city the ability to utilize the Flint River as an emergency source of water ~~in the~~ if water service from KWA is interrupted & the city elects to use the Flint River as its emergency source. It is the DEQ's understanding that the City of Flint intends to use raw water from the KWA as its sole source. Any use of the interconnect; however to blend raw water from the KWA and the Flint River would be decided by the City of Flint.

Historically, the Flint Water Treatment Plant utilized the Flint River as the source for providing drinking water to its customers. In 1967, the city of Flint (City) started to purchase treated water from the Detroit Water and Sewerage Department (DWSD). The DWSD water source is Lake Huron. The Flint River supply infrastructure to the water treatment plant was continuously maintained as a reserve (emergency backup) source to the system.

Over time, the DWSD source became financially strenuous to the City and in January 2006 discussions ensued regarding utilizing the proposed Karegnondi Water Authority, which was not yet constructed, as an alternative primary long-term water supply for Genesee County and the Flint Water Treatment Plant customers. In 2009, the Lake Huron water supply study for the Karegnondi Water Authority was conducted and an Executive Summary and Preliminary Engineering Report were generated. Due to the financial strains the City was experiencing, they resolved to end their contract with DWSD and temporarily convert the water supply back to the Flint River as the source for the Flint Water Treatment Plant prior to the completion of the Karegnondi Water Authority. In April 2014 the Michigan Department of Environmental Quality (MDEQ) issued the Flint Water Treatment Plant construction permits for full time operation enhancements. In May 2014, the conversion of the source was implemented and the Flint Water Treatment Plant began distributing water to its customers.

*To ensure compliance with the federal Lead and Copper Rule requirements for corrosion control, The City commenced two 6-month lead and copper monitoring periods. A report from the first 6-month monitoring period ended on December 31, 2014, and the City's report was due to the MDEQ on January 10, 2015. The results from this report indicated the lead level (90<sup>th</sup> percentile) was 6 ppb, just over the 5 ppb level deemed as having optimized corrosion control. On March 30, 2015 the MDEQ notified the City of these results.*

*In October April 2015, MDEQ and the USEPA began discussions regarding the City of Flint's use of corrosion control treatment.*

*On June 30, 2015, second 6-month lead and copper monitoring period ended. After initial consultation with the EPA on July 21, the MDEQ notified the City of the results on August 17, 2015. At that time the MDEQ reported that their analysis indicated a lead level of 11 ppb (90<sup>th</sup> percentile), and required the City to install corrosion control equipment and begin treatment.*

*On July 28, 2015 the MDEQ received information from Michigan Department of Health and Human Services (MDHHS) indicating blood lead levels in City of Flint residents were consistent with past years seasonal variations.*

*On September 24, 2015 Hurley Children's Hospital revealed data indicating elevated blood lead levels in children who reside certain zip codes in the City. This same date the MDHHS reaffirms that their data is more comprehensive than that of Hurley Children's Hospital and remained consistent with past year seasonal variations. On September 25, the City announced a lead advisory regarding the drinking water to its citizens.*

On October 1, 2015 the State Chief Medical Officer confirms Hurley Children's Hospital blood lead level data. On this same date the Genesee County Health Department issued the customers of the Flint Water Treatment Plant a "Do Not Drink" advisory. On October 2, the state announces the Governor's Flint action plan. On October 15, 2015 the state legislature authorizes \$9.35 million to help fund the City's return to purchasing treated water from the DWSD, and to fund comprehensive lead evaluations at City schools, provide free water filters for residents, provide free in-home water tests for residents, and provide free blood lead level testing and follow-up services.

On October 16, 2015 the Flint Water Treatment Plant reverted its source back to DWSD. On October 28, 2015 the MDEQ issued a construction permit for additional corrosion control treatment.

The MDEQ is supporting the response with incident management personnel, lead and copper water test kits and analysis and investigative teams. The connection to the Karegnondi Water Authority is scheduled to be completed in mid to late 2016.





RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING



DAN WYANT  
DIRECTOR

## **Backgrounder on City of Flint Water**

After a change in the water source for Flint residents, there have been concerns related to the water quality, in particular lead in the water, and its impact of the community. As a result, Department of Health and Human Services (DHHS) and the Department of Environmental Quality (DEQ), working with local public health departments and the City of Flint (City), have put together an Action Plan to address public health concerns in the City.

While Flint water is meeting all state and federal drinking water standards, there is an increasing level of concern that the Flint River is not the best water source. The City's Technical Advisory Committee recommended the City switch back to DWSD. In addition, recent studies by Hurley Children's Hospital, and confirmed by DHHS, have indicated a rise in blood lead levels in some Flint children. Sample screening completed last week by the DEQ indicated that some Flint Public Schools have detectable lead levels in their water.

### **Action Plan:**

Immediately, the City and State announced the following steps:

- Governor named Dr. Eden Wells as Flint Public Health Advisor
- Advisories issued recommending residents flush their cold water pipes before use, as well as only use water from the cold water tap for drinking, cooking and especially making baby formula.
- Schools are advised to not use the drinking water fountains and are using bottled water.
- Free filters are available to all households in Flint, along with replacement filters.
- Flint Public Schools were screened for lead exposure.

For the near term, the City and State are asking for/ doing the following:

- Switch the drinking water source from the Flint River to DWSD.
- Test and inspect all schools in Flint, including charter and parochial schools.
- Free water testing for all homes.
- Expand exposure testing to additional households in Flint.

For the long term health of all Flint residents, the City and State have committed to:

- Switching to the Karegnondi Water Authority in the summer of 2016 as the permanent water supply for the City of Flint
- Allow for Drinking Water Revolving Loan funds to be used to expedite the replacement of private residential lead service lines.
- Lead exposure campaigns for homes, schools and communities.

**Budget Request:**

To facilitate the action plan outlined above, the State is requesting \$10.6 million (\$8.2 million GF). The funding will address 4 priority areas:

1. Provision of filters for residential service (\$2,016,000)

Filters will be provided to all Flint households, including replacement filters until the system is fully optimized. Each filter cost is \$20.

2. 50% of the estimated cost to reconnect temporarily to the DWSD (\$6,000,000)

The City has estimated it will cost an additional \$1.3 million per month to use DWSD instead of the Flint River. The State and City have agreed to split the cost through July 2016 when the new Karegnondi Water Authority will be completed and Flint will switch to that water source.

3. Funding for testing water samples (\$1,000,000)

New testing protocols for schools will require each faucet in the school be tested and evaluated at the State's lab. In addition, lead exposure testing in homes will result in thousands of additional samples that will need to be evaluated. Each sample cost \$26 to process.

4. Lead exposure testing and inspections (\$1,600,000)

DHHS, DEQ and LARA are pulling together a team to go into schools and high risk homes to test and evaluate lead exposure.

**Thelen, Mary Beth (DEQ)**

---

**From:** The Office of Senator Ananich <SenJAnanich@senate.michigan.gov>  
**Sent:** Wednesday, October 21, 2015 12:43 PM  
**To:** hedman.susan@epa.gov; mccarthy.gina@epa.gov  
**Cc:** Jordan.Dickinson@mail.house.gov; mayor@cityofflint.com; HCroft@cityofflint.com; poy.thomas@epa.gov; Schock.michael@epa.gov; Lytle.darren@epa.gov; fortin.denise@epa.gov; Wyant, Dan (DEQ); aaron\_suntag@stabenow.senate.gov; Bentley.Johnson@peters.senate.gov; Davis.CatherineM@epa.gov; repphelps@house.mi.gov; SheldonNeeley@house.mi.gov; snyder  
**Subject:** Letter Requesting EPA Review of Flint, MI Water  
**Attachments:** 2015.10.21 EPA Review Request FINAL.PDF

PPI

Administrator McCarthy and Regional Director Hedman,

Please see the attached letter regarding a request for an EPA review of Flint, Michigan's water treatment.

Please do not hesitate to contact my office if you have any questions. Thank you for your time and attention.

Sincerely,

The Office of State Senator Jim Ananich  
Michigan Senate Minority Leader  
District 27



CC: S492

George K.

Liane Shellen

Steve Busch

Maggie Pollack

Brad Wunfel

Director asked  
that I  
provide you  
a copy.

mlt  
10-23

Orig: Duesch

SENATE MINORITY LEADER  
**JIM ANANICH**

517.373.0412  
senjananich@senate.michigan.gov  
senatedems.com/ananich

f /jimananich @jimananich

October 21, 2015

Gina McCarthy  
**Administrator**  
United States Environmental Protection Agency  
Ariel Rios Building  
1200 Pennsylvania Avenue, N.W.  
Mail Code 6106A  
Washington, DC 20460

Susan Hedman  
**Regional Administrator**  
United States Environmental Protection Agency Region 5  
Ralph Metcalfe Federal Building  
77 West Jackson Boulevard  
Chicago, IL 60604

**Re: EPA Review Needed on Flint, Michigan Water Treatment**

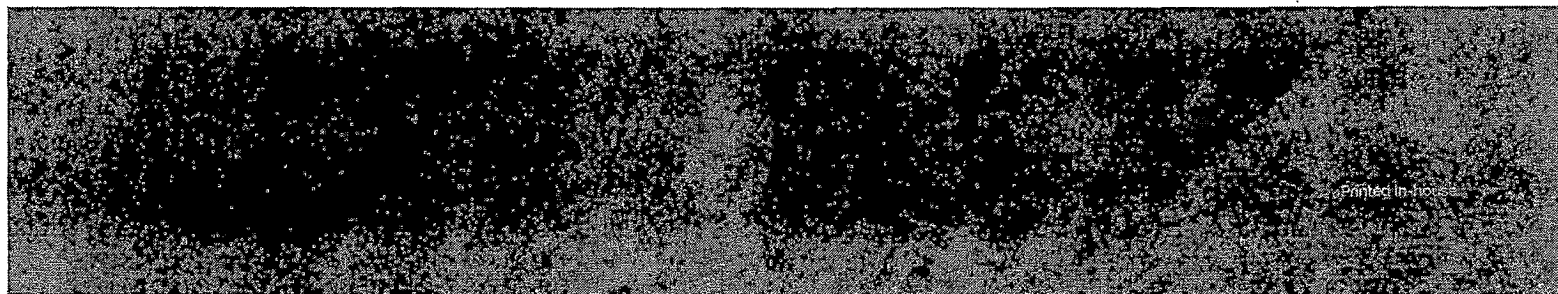
Administrator McCarthy and Regional Director Hedman,

Today Congressman Dan Kildee requested that the United States Environmental Protection Agency conduct an investigation into the water system in Flint, Michigan. I agree that such an investigation is vital to ensuring that the people responsible for Flint's dangerous water quality are held accountable. Similar to Congressman Kildee's request, I am requesting the EPA conduct a review of the Michigan Department of Environmental Quality's (MDEQ) oversight of water treatment in Flint as provided for in the Lead and Copper Rule, 40 CFR Sec. 141.80.

After decades of relying on water from the Detroit Water and Sewerage Department (DWSD), Flint began treating its own water from the Flint River in April 2014 at the behest of state-appointed Emergency Managers. DWSD had used — and continues to use — anti-corrosion treatments in its water to prevent lead leaching from an aging infrastructure into residents' drinking water. For a number of reasons, raw water from the Flint River is significantly more corrosive than the lake water that DWSD uses. Despite this, Flint chose not to treat the raw Flint River water by any method traditionally associated with preventing lead corrosion. Multiple consultants and the EPA advised the city to use additional corrosion control measures, but that advice went unheeded by the City of Flint and the MDEQ.

Foreseeably, lead has been seeping into Flint's drinking water for more than a year, causing an alarming rise in the number of children in Flint with elevated blood lead levels. Independent research conducted by Virginia Tech professor Marc Edwards indicated high lead levels in tap water, and a study led by Hurley Medical Center pediatrician Dr. Mona Hanna-Attisha revealed that in high-risk areas of the city, the rate of lead overexposure among children more than doubled since switching water sources. State data have confirmed these results.

Additionally, several questions remain regarding how Flint and state officials conducted water sampling under the Lead and Copper Rule. Allegedly, officials did not target samples in high-risk Tier 1 locations or repeat locations in subsequent tests. Consumers were also instructed to pre-flush their taps prior to collecting samples, resulting in lower lead level results. It is unclear whether a sufficient number of samples were taken or why MDEQ excluded two high lead level samples from Flint's July 2015 water quality report.



SENATE MINORITY LEADER  
**JIM ANANICH**

517.373.0412  
senjananich@senate.michigan.gov  
senatedems.com/ananich

 /jimananich  @jimananich

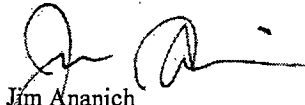
The State of Michigan has pledged to help reconnect the City of Flint to DWSD and take additional steps to help remediate the lead problem. However, these are stopgap measures that will never undo the damage already done.

Ultimately, the EPA retains the ability and responsibility to oversee the state's efforts to obtain and maintain safe drinking water for its residents. As such, I appreciate that the EPA has established the Flint Safe Drinking Water Task Force. However, it also is within the EPA's power to review the actions of MDEQ and the City of Flint as they pertain to lead testing and treatment under the Lead and Copper Rule. We want to ensure Flint remains compliant once it switches its permanent water source to the Karegnondi Water Authority.

I respectfully request that, under 40 CFR Sec. 142.19, Regional Administrator Hedman review MDEQ's determinations regarding corrosion control for lead in Flint, Michigan. Regardless of the findings, I am also requesting that Regional Administrator Hedman make public all evidence gathered during the course of that review. Michigan citizens deserve to know whether MDEQ is operating safely and effectively.

If you have any questions, please contact my office at [senjananich@senate.mi.gov](mailto:senjananich@senate.mi.gov) or (517) 373-0142. Thank you for your consideration.

Sincerely,



Jim Ananich  
Senate Democratic Leader  
District 27

cc:  
Governor Rick Snyder  
U.S. Representative Dan Kildee  
U.S. Senator Debbie Stabenow  
U.S. Senator Gary Peters  
State Representative Sheldon Neeley, District 34  
State Representative Phil Phelps, District 49  
Mayor Dayne Walling, City of Flint  
Howard Croft, City of Flint  
Susan Hedman, EPA  
Thomas Poy, EPA  
Michael Schock, EPA-ORD  
Darren Lytle, EPA-ORD  
Denise Fortin, EPA  
Dan Wyant, MDEQ  
Liane Shekter-Smith, MDEQ  
Pat Cook, MDEQ  
Stephen Busch, MDEQ  
Brad Wurfel, MDEQ  
Marc Edwards, Virginia Tech

12/11/2015

Call + Mtg. w/ EPA, city, of Flint + LAM

- Mayor Weaver
- Natasha Henderson
- Mike Glasgow
- Mike Popsky
- George Kristian
- Dr. Wells
- Jeff Hancock
- Warner Green
- Summit
- Shelly Edgerton, DHARA

Phone

- Jim Sygo
- Dennis Lytle
- Tim Henry
- Tom Poyl
- Jeff ~~the~~ Kopic <sup>USEPA</sup> Wash DE

CS 2 Phos Act

3.2 at Plant Tap PQ

Distr 2.9 PQ

- #54 down for repair
- Dort Reservoir has DWSD water
- Treatability Studies for KWA
- 72" connection for KWA DWSD current

Tim Henry

- Compile as much info as possible
- 
- Sample results
- LSL testing
- Assessment of water for OCT

EPA

#1 Recommendation

is use of KWA + WTP

Smaller Scale Testing

- time
- \$, open + infra + DWSD
- other in country



City Evaluation of WTP to Lake Huron  
Since 1998

KWA treatability studies  
on

2004 KWA Study determined  
water quality compared to Port Huron  
+ Sag. Midland @  
WQ  $\approx$  identical  
seasonal variability

KWA  $\rightarrow$  Genesee County

Starting in January  
Bench Scale Treatability  
on KWA water

Plant Design work in early 2000's

2 options on Treatability

- Whitestone Pt. Sag Midland ok with that

- KWA Intake Uncertain Availability



≈ 57 MG Storage  
4-5 days

- Another line for WTP feed?
  - Finished GC water
  - Benefit to both
  - 10-13 MG flow

## DEQ Timeline

- ✓ 1/28/2015 - Meeting requested by Hurley Hospital and McLaren hospital with Department of Community Health (now Dept. of Health and Human Services) and Department of Environmental Quality staff concerning Genesee County Health Department response to Legionellosis Investigations.
- ✓ 1/30/2015 DEQ provided DCH staff with City of Flint water system information.
- ✓ 3/17/2015 - DEQ call and email to the City of Flint regarding optimization strategies to help minimize the potential for outbreaks in customer plumbing systems
- ✓ 3/10/2015 - 3/19/2015 - Discussion with Genesee County Health Department regarding information requests Genesee County made to the City of Flint (DEQ shared with DCH on 3/12)
- 4/8/2015 - Conference call between DCH (DHHS) and DEQ regarding DCH case and epidemiology status update (Prysby and Shekter Smith)
- 4/9/2015 - 4/10/2015 - DEQ staff attended smart water summit via live stream on Legionella issues
- ✓ 4/14/2015 - Meeting between DCH (DHHS) and DEQ (Prysby, Busch, Philip, Shekter Smith)
- 4/14/2015 - DEQ call with EPA regarding EPA ORD assistance abilities for City and DCH.
- 4/24/2015 - DEQ emailed DCH with City of Flint water quality information from sampling and operational monitoring
- 4/24/2015 - DEQ notified DCH via email of meetings with hospitals scheduled for 4/29/2015
- 4/29/2015 - DEQ Meetings with the following regarding secondary treatment and premise plumbing
  - Hurley Hospital
  - McLaren Hospital
  - City of Flint Cross Connection Inspection/Plumbing Inspector
- 5/1/2015 - DEQ emails with information regarding water safety plans and best practices to
  - Hurley Hospital
  - McLaren Hospital
- ✓ 5/1/2015 - DEQ emails to City of Flint Cross Connection Inspector / Plumbing Inspector with info on identifying customers that should consider development of a Water Safety Plan for their premise plumbing
- 5/5/2015 - DEQ ODWMA internal meeting to discuss how to proceed regarding secondary treatment
- ✓ 5/12/2015 - Response from the City of Flint with list of customers that may need a Water Safety Plan
- ✓ 6/5/2015 - 6/8/2015 - Email communications between Genesee County Health Department and DCH regarding epidemiology status update
- ✓ 6/15/2015 - DEQ Meeting with Dept. of Licensing and Regulatory Affairs regarding Secondary Treatment
- ✓ 6/19/2015 - DEQ Letter to Michigan Society for Health Care Engineering and Michigan Health and Hospital Association regarding secondary treatment
- ✓ 7/30/2015 - DEQ Holds Hospital/Health Care Facility Treatment of Water Received from a Public Water Supply Meeting

**Thelen, Mary Beth (DEQ)**

---

**From:** Marc Edwards <edwardsm@vt.edu>  
**Sent:** Thursday, October 15, 2015 10:44 AM  
**To:** Wyant, Dan (DEQ); lwalters313@gmail.com; Andrew Leavitt; Melissa Mays; Dickinson, Jordan  
**Subject:** Urgent Request for Clarification: Letter to Lee-Anne Walters and justification for invalidating her samples.

Hi Dan,

Thank you for your help (if any) with the MDEQ FOIA. I received the documents last night. I was hoping you could help me with something ASAP.

One of the things creating distrust between Flint residents and MDEQ, is a long list of miscommunications and false statements by your employees. I want you to help us understand one of those miscommunications as soon as possible.

On August 4<sup>th</sup> your employee's Wurfel, Busch and Shekter Smith met with Melissa and Lee-Anne. According to Melissa and Lee-Anne, in a meeting with the governor's Chief of Staff, your employee's could not explain to them, why Lee-Anne's samples were invalidated (i.e., thrown out of the samples used to calculate the 90<sup>th</sup>ile lead).

For your information, on the basis of records from the City, **Lee-Anne's home is the ONLY home in the 2015 sampling pool that is proven to have a lead pipe.** I have compared the sample sites that the city used to the database that Flint has put together, **and of 11 samples in the database that the city claims had a lead pipe, ZERO actually had a lead pipe.** Michigan and Federal law further states that if a sample is taken from a home with a lead pipe, **even if it has a point of use device like a filter or softener**, once that sample is collected it cannot be invalidated (see below). EPA R5 staff explicitly told your employee's in writing, that Lee-Anne's samples had to be counted for compliance purposes. **Your employee's nonetheless, over R5's written instructions and the law, threw out the only Flint LCR samples known to be legitimate in the 2015 sampling round.** They also double counted Melissa's samples for LCR compliance purposes, even though her house does not have a lead pipe, and has no lead plumbing. So I hope you can see the "adding insult to injury" dimension of your employee's actions. The irony-- using samples from the chief critics of MDEQ, to cheat on the LCR monitoring. Specifically, counting a lead free site twice (when it should not be counted at all), and throwing out three samples from the only home known to have lead pipe. We also now have data that shows every single sample we could check in the 2015 round, did not have a lead pipe at all.

Furthermore, according to Melissa and Lee-Anne, the Governors chief of staff ordered your employee's, to as soon as possible, communicate to Lee-Anne why her samples were invalidated. According to Melissa and Lee-Anne, the governor's chief of staff further ordered your employees to "CC" him on that communication. The governor's chief of staff also apparently asked them to get Lee-Anne's address and phone number, so that they could be sure their communication got to her, and they refused, and insisted they had all of Leigh-Anne's information.

In the FOIA production, I was surprised to see that there is an e-mail to Lee-Anne dated August 25<sup>th</sup>. This is surprising because Lee-Anne never received that e-mail. Moreover, there is an apology to Lee-Anne that the e-mail is late, and furthermore, the chief of staff is not cc'd. Lee-Anne has looked in her spam and other files, and there is no evidence that this late e-mail ever reached her.

I am hoping you can get to the bottom of this, and see first of all 1) why the chief of staff was not cc'd as requested, 2) if this e-mail was actually sent, and produce some evidence that it was, and 3) try to understand why your employee's illegally invalidated Lee-Anne's samples over the objections of EPA and Lee-Anne. And I am hoping you can do this

today. My understanding is that you are out and about trying to re-establish public trust in MDEQ, and this would be a good place to start.

Best Regards,

Marc Edwards

From your own web page.

c. Softeners and Other Point of Use (POU) and Point of Entry (POE) Devices:

**Sampling sites with faucets that have POU or POE treatment devices, such as softeners, shall not be used as Tier 1, 2, or 3 sites unless insufficient Tiered sites are available. Field staff shall encourage water supplies to sample from a kitchen or bathroom tap that is not normally connected to the softener. If a sample of softened water is analyzed, then the water supply may consider returning to the same site to collect a sample of unsoftened water. Some residents may be able to bypass the softener at the tap. Both sample results (softened and unsoftened) will be used to calculate the 90th percentile. Sample results shall not be deemed improper on the basis that the water passed through a softener.**

## Proposed Scope of Upgrades to Flint WTP

### 1. Introduction

The City of Flint plans to utilize their existing WTP to provide water on a continuous basis. The city plans to treat water from the Flint River until construction of the proposed KWA supply is complete and the WTP can then be used to treat water from Lake Huron. An evaluation of the WTP to provide treatment of water from both sources is in process to define the scope of upgrades needed to provide reliable service. In addition to the different treatment requirements of each source, the WTP has not been operated on a continuous basis for 40+ years so facilities are also being evaluated to identify equipment which should be replaced because of its age, condition, or obsolescence.

### 2. Preliminary Scope of Work

Based on the WTP evaluation, the following scope of proposed upgrades has been developed. This summary is preliminary, provided for review and comment by interested parties. Comments received will be used to finalize the scope of work to be implemented at the Flint WTP.

The proposed upgrades have been categorized into two phases. Phase 1 is work that will be completed as soon as practical so that the WTP can be utilized to treat water from the river in 2014. Phase 2 work is needed to provide long-term service with the proposed KWA Lake Huron water source. Phase 2 work will be completed in 2015 to 2016.

Short  
Term  
for anything  
not KWA

Work is proposed to be contracted except where noted "by city" the work is planned to be completed by City staff.

#### Item 1 – Chemical Systems / Ozone

Additional storage of nitrogen and oxygen will be provided for redundancy and 30 day capacity.

Existing ozone units will be serviced to prepare for continuous operation.

New alternative coagulant chemical feed system will be added for treatment of raw water from Lake Huron.

| Phase 1                                 | Phase 2                   |
|---|---------------------------|
| Oxygen and nitrogen storage             | New coagulant feed system |
| Service existing ozone system (by city) |                           |

Potential vs. Certain

1 tank each add leach  
total  
+ piping redundancy

C\*T vs. Dact

Coagulated  
w/ G.A.  
WTP

Preliminary – For Review and Comment JWG

August 20, 2013

2003 Ozone Pilot Study

Inadequate Residual in Tank 2 for C\*T

Pre Oxidant to reduce chlorine demand  
w/ Lake Water could get C\*T credit

CAT 12MGD + 18MGD

LS ppm

28 BATH Factor

### Item 2 – Electrical

The WTP presently uses 2400V as primary power. Power feeders and switchgear are rated at 5kV. Upgrading the primary power to 4160V will enable existing power feeders to provide twice the power and eliminate the need to install new feeder circuits throughout the WTP.

The current substation has two 2.5 MVA transformers running in parallel for a total capacity of 5 MVA. The transformers are obsolete. It is planned that the transformers and conductors to the WTP will be replaced to provide two independent power sources for redundancy. The existing on-site backup power generators are obsolete and inoperable. Since two independent power sources will be provided to the WTP, replacement of the generators is not proposed.

Electrical switch gear and equipment at Pump Station 4 will be replaced.

If filter presses (or other equipment) are utilized for dewatering of softening sludge, a new power feed will be required to the equipment.

Electrical switch gear and equipment at Plant 2 will be replaced.

| Phase 1                                      | Phase 2                         |
|--|---------------------------------|
| Upgrade existing substation and power supply | Upgrade power system at Plant 2 |
| Upgrade facilities at Pump Station 4         |                                 |
| Power to filter presses? TBD                 |                                 |

### Item 3 – Mid-Point Chlorination

Mid-point chlorination facilities are proposed, including the following principal components:

- Feeders, scales, monitors
- Piping, valves, and controls
- Scrubber
- Ton Containers
- 

| Phase 1                | Phase 2 |
|------------------------|---------|
| Mid-point chlorination |         |

#### Item 4 – Security Measures

Add three additional security cameras to monitor the following areas:

- Chlorine storage area
- Oxygen and Nitrogen storage area
- East side of WTP property

| Phase 1                               | Phase 2 |
|---------------------------------------|---------|
| Additional security cameras (by City) |         |

#### Item 5 – Low and High Service Pump Station No. 4

As a result of decreased demands, pumps at Pump Station No. 4 are "over-sized" and do not efficiently operate. Some of the pumps experience vibrations in the shafts and steady bearings. The existing pump station will be rehabilitated to replace "over-sized" pumps and obsolete equipment and provide needed maintenance. Proposed work includes:

- 25 mgd Low Service Pump No. 4 – upgrade motor to inverter duty, rehabilitate pump and piping, install new valve, and install new VFD
- 15 mgd Low Service Pump No. 6 – rehabilitate pump shaft and bearings
- Install two new High Service Pumps (15 mgd @ 190 feet TH, vertically mounted pumps with 800 HP 2400/4160 V inverter duty motors, with 20 feet of shaft and steady bearings) *VFD*
- Replacement of existing piping, valves, supports, and bearings
- New intermediate platforms, ladders, & stairs
- New ventilation (for exhausting heat from VFD's)
- Install two medium voltage VFD units
- Demolition of existing equipment to accommodate new equipment

Rehabilitation of Pump Station No. 4 is planned to be completed in two phases. A new high service pump and a new low lift pump will be installed initially to provide efficient service during the period when water from the Flint River is treated. Additional high service and low lift pumps will be installed later to provide long-term reliable, efficient service.

| Phase 1  | Phase 2   |
|--|---|
| <i>Low Service</i><br>Rehabilitate Pump 6 shaft and bearings (by City) | Rehabilitate 25 mgd Low Service Pump No. 4, new motor, new valve, new VFD |
| New High Service Pump No. 1  | New High Service Pump No. 2   |
| Install VFD for Pump No. 1   | Install VFD for Pump No. 2  |
| Provide ventilation for Pump No. 1                                     | Provide ventilation for Pump No. 2  |
| Demolition of existing equipment                                       | Demolition of existing equipment  |



\$5M?

#### Item 6 – Filter Transfer Station

Recent changes in regulations, enhanced CT is required. Additional CT can be provided by including the volume of the Dort Reservoir in the process train. However, because of its elevation with respect to other treatment processes, pumping will be required to utilize the reservoir. The proposed pumping facility will provide for the following:

- Three 12 mgd @ 40 ft TH vertical turbine pumps with 150 HP, 480 V inverter duty motors are planned.
- Valves and Controls
- Ventilation and boiler system
- Three low voltage VFD's
- Power feeders
- MEP
- Piping connections
- 200 feet of 30" water main
- 600 feet of 36" water main
- Site work, paving, & utilities

| Phase 1                      | Phase 2 |
|------------------------------|---------|
| Filter Transfer Pump Station |         |

#### Item 7 – SCADA

As new pumps, chemical systems, and controls are installed; instrumentation and monitoring should be provided. It is proposed that the SCADA network is upgraded to current technology and software and training provided in the initial phase.

| Phase 1                  | Phase 2                  |
|--------------------------|--------------------------|
| SCADA Network Upgrade    | SCADA Hardware (Phase 2) |
| Software and Training    |                          |
| SCADA Hardware (Phase 1) |                          |

*Expansion of SCADA system*

### Item 8 - Raw Water Piping Connection

The proposed KWA raw water pipeline will connect to the existing 72" PCCP finished water supply line near Center and Pierson Roads. (East of this connection, the 72" PCCP will be utilized by GCDC-WWS for distribution of finished water in the GCDC-WWS service area.) Raw water from Lake Huron will be conveyed to the WTP site via the 72" PCCP pipeline. On the WTP site, the 72" pipeline will be tapped for a 42" pipe and for a 36" pipe to convey raw water for treatment. The following work is proposed:

- Piping connections
- 900 feet of 42" water main
- 100 feet of 36" water main
- Roadway and site restoration
- Storm sewer relocation
- Control valve rehabilitation and replacement

Hard break between  
Raw + Finished Water

still do tie ins when  
pipe is down

| Phase 1 | Phase 2                      |
|---------|------------------------------|
|         | Raw water piping connections |

### 3. Other Items to Address to Finalize Scope of Work

In addition to the upgrades proposed above, the following issues/questions need to be addressed before finalizing the scope of proposed upgrades to the WTP:

- Options for handling / disposal of lime sludge from softening operations (during period Flint River is water source)
- Requirements for CT and enhanced treatment
- Impacts of using river as continuous supply (quantity, quality monitoring & control, reservoir operating levels)
- Chemical storage options

✓ No Bray Road → Waste Remediation Plan w/ OWMRF

- Old Saddle Basins for Storage

PA Company Filter Press North End  
Ventilation Issues w/ Trucks

- Pump out supernatant → to sewer?

UV unit piping

Transfer Station

would have provisions

- Valve issues associated  
so didn't move forward

setup in parallel is ok

CAT for crypto must be perf tested

- Use of Durb as Raw Water Storage

- Jim Scott - Health Facility Engineering DLARA
- Teri Dyke - Hospital Section Manager
- Joe Medeiros - Plumbing Chief

DEQ

- Liann
- Carrie
- Margaree (Intern)
- Richard
- Mike P.
- Steve Busch
- Dana Bryan

- Premise Plumbing Treatment
- Consp to Mich Health + Hospital Association
- CWS vs. Non-Community
  - ↳ Municipal, MHP, Apl, Cards,
- MOU in place for DW Regulation

① Treatment  
of ④ criteria for exception

VAD Director  
↳ Facility w/ "on-site patients"

Health Facility Engineer

Review + Approve

No Permit for under \$1M but many get  
for some liability protection

Would like a treatant but no regulation specific to  
treatment falls to plumbing division

Center for Medicine + Medicine Services

Permit Required for Modification  
but may not be pulled

Michigan Society for Healthcare Engineering  
Sept. Annual Conf

Norbert Birchmeyer, Harley Medical  
810-262-9364

Don't Drink Marijuana

## Implementation Protocol

1. Establish an HACCP team (responsible + accountable)
2. Describe the water system(s)
3. Develop process flow diagrams
4. Confirm process flow diagrams w/ onsite audits
5. Perform systematic hazard analysis and risk characterization
6. Determine critical control points
7. Critical Control Limits (quantitative parameters)
8. Monitoring Method and Frequency
9. Corrective Actions
10. Verification of HACCP implementation
11. Verification of hazard control
12. Documentation, communication, + record keeping

Mike Mayer @ hurleymc.com

All cases community acquired



## - The Action Plan -

- Immediately test all Flint public schools to ensure that **drinking water is safe**. Testing will also be available at no cost to any other school in Flint.
- **Expand health exposure testing** of individual residences.
- **Offer water testing** at no cost to Flint residents to assure water is safe.
- **Expedite optimizing corrosion controls** in the Flint drinking water system.
- **Assemble the "Safe Drinking Water Technical Advisory Committee"** to ensure the best technology, practices and science are being utilized, and add an expert from the EPA's Office of Research and Development to the group.
- **Accelerate water system improvements** to address replacement of lead service lines.
- Expedite completion of **Karegnondi Water Authority**.
- Gov. Rick Snyder names Dr. Eden Wells as the Flint Drinking Water Public Health Advisor to ensure safe drinking water.
- **Provide water filters** to residents of Flint.
- Expand a comprehensive lead education initiative.

To get your water tested for free, please call the city of Flint Water Plant at (810) 787-6537 and then press 1

Visit [www.mi.gov/FlintWater](http://www.mi.gov/FlintWater) for more information



## Flint Drinking Water Task Force (FTF 15-5)

### Task Force Recommendations Regarding Flint Drinking Water Treatment Performance Evaluation

For protection of public health, Flint must avoid significant distribution system issues similar to those experienced following the source water switch to the Flint River and subsequent operation of Flint's water treatment plant.

The EPA Flint Safe Drinking Water Task Force recommends that Flint develop and implement a Performance Assessment Plan prior to distribution of water from the Karegnondi Water Authority (KWA) source. The plan must address how the treatment plant will be brought on-line, and how finished drinking water will be introduced to the distribution system. This plan is particularly important given the City has no experience treating the KWA-supplied water, and is operating a distribution system that is still recovering from the past upset.

Flint should work with its consultant and MDEQ to establish objective water quality and plant performance criteria. The plan must include operation of Flint's drinking water treatment plant for a reasonable period of time to treat KWA-supplied water until:

- (1) the treated water meets finished water quality goals;
- (2) the finished water quality is consistently maintained;
- (3) potential plant operational and mechanical start-up issues are identified and addressed; and
- (4) water plant operations staff are proficient in treating the new source.

KWA water should not be distributed to the public until these conditions are satisfied.

During this performance evaluation period, Flint must distribute to the public water from an alternate source. As water is already received from Detroit (Great Lakes Water Authority), that is an obvious and appropriate choice for that interim period. The length of the performance evaluation period will be dependent on the amount of time it takes for the treatment plant to consistently and reliably meet the performance criteria.

Because of similarities in source water and in treatment processes with Detroit's Huron plant, the Flint water plant will likely be configured to produce treated water with similar quality to that of the water currently being received from Detroit. Continued use of Detroit water during the performance evaluation period will minimize the risk of distribution system upsets.

We encourage Flint and the City's consultant to perform a number of assessments prior to the completion of the KWA pipeline and availability of the Lake Huron source water to expedite the plant transition period. For example, the planned bench-scale jar tests will be helpful in establishing full-scale treatment plant operating parameters. Assessment of corrosion control treatment using Detroit source water with lead pipe loop rigs in advance of switching to the KWA source may also be transferrable to the KWA source water. Pipe loops rigs operated during the performance assessment period will help predict whether lead release will be an issue when the new plant goes on line. EPA will work with the City to set up pipe loops at the Flint treatment plant.



Glen Thomas Flint

45 locations 52 service contracts to  
cooling towers / chillers

- some vacant

-

- Months before X-con reminder sent out  
potential flyer

## - Flint Startup Issues

Revised DBP Plan

↳ 4 sites → 8

Pb & Cu 23 under conser sys → 50 June - Sept

WQP retrofit 25 sites

monthly TOC ↗ Corrosion Control Solution  
Pb & Cu check w/ Jan & Feb

Plant Improvements

- Chemical Storage for ozone LOX & Nitrogen
- HSP VFD
- Electrical Controls

\* C \* T → - Mod Part CI

## Construction Schedule

WTP - ozone

- Rapid Mix

- Flocc

- Settling w/ Plates

- Clarifiers

- Filters

Operator



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
EXECUTIVE OFFICE  
LANSING

BRIAN CALLEY  
LT. GOVERNOR

**CONTACTS:**

Sara Wurfel or Dave Murray  
Governor's Office: 517-335-6397

Brad Wurfel, 517-284-6713  
Department of Environmental Quality

Jennifer Eisner, 517-230-9804  
Department of Health and Human Services

**FOR IMMEDIATE RELEASE**

Thursday, Oct. 8, 2015

## **Gov. Rick Snyder: Move back to Detroit water provides best protection for public health in Flint**

*State, Mott Foundation and city form partnership to fund switch*

FLINT, Mich. — Flint families and children will be better protected by reconnecting with the Great Lakes Water Authority as the source of the city's drinking water, Gov. Rick Snyder said.

Snyder said Thursday that he will request the state Legislature to provide half, or \$6 million, of the \$12 million needed to reconnect with the authority. The Flint city government will provide \$2 million and the Charles Stewart Mott Foundation will donate \$4 million.

"All Flint residents need clean, safe drinking water," Snyder said. "The technical experts helping the city on its water advisory all agree this move back to the Great Lakes Water Authority provides the best public health protection for children and families. This effort today is the result of people coming together to solve a problem. I appreciate Detroit's willingness to reconnect with Flint, the Mott Foundation's generous donation, and the dedication of all parties to come together to protect Flint families and children."

The Michigan Departments of Environmental Quality and Health and Human Services today also committed an additional \$3.5 million for water filters, free lead testing through the state laboratory for Flint water customers, and hiring additional staff to conduct health exposure monitoring for lead in drinking water.

Flint city leaders requested the state's help to fund the reconnection after a Wednesday meeting of Flint's Technical Advisory Committee. Flint's move to the Great Lakes Water Authority is expected to cost about \$1.3 million per month until the Karegnondi Water Authority is completed next summer.

**INSERT MAYOR QUOTE HERE**

The move to Detroit water, which is drawn from Lake Huron, carries many public health benefits. As large bodies of water, the Great Lakes are naturally prone to fewer problems from large rain events and other runoff issues that can be present in shallower rivers. Additionally, the Great Lakes Water Authority has already fully optimized its corrosion control, using phosphates to help coat the insides of pipes and prevent lead from leaching into the water.

However, reconnecting with the authority will not completely resolve the city's problem with lead service lines or aging infrastructure. It will take time for pipes in Flint to become coated with the phosphate corrosion control. Additionally, some households in the city could experience lead in their drinking water until all lead pipes and plumbing are replaced.

#### **INSERT MOTT FOUNDATION QUOTE HERE**

To best protect public health, Snyder said state and local authorities will continue to carry out steps outlined on Oct. 2 in a comprehensive action plan, including continued testing, the use of faucet filters and providing residents with accurate information about steps to eliminate lead exposure.

Free filters are available for current MDHHS clients at the 125 E. Union St. or 4809 Clio Road MDHHS office locations. For residents who are not currently enrolled in MDHHS assistance programs, free filters are available at the Genesee County Community Action Resource Department offices at 2727 Lippincott and 601 North Saginaw in Flint. Staff will be at all four locations from 9 a.m. to 4 p.m., Monday through Friday, to distribute filters and assist residents who have questions about proper installation. At the Lippincott location only, extended hours will be offered this weekend, including until 7 p.m. on Thursday and Friday and from 10 a.m. to 2 p.m. on Saturday.

Other good practices for residents concerned about lead include turning on the cold water tap and running the water until it's as cold as it will go. Additionally, only use cold water for cooking, drinking and especially mixing baby formula.

#### ***School test results released; more investigation planned***

The state today also released the first results from its lead screening program in schools and homes. Of 37 total samples taken at 13 buildings, four samples spread over three buildings exceeded the federal action level of 15 parts per billion.

However, this sampling provides only an initial screen, and the state is committing to further testing water and inspecting plumbing at these schools. Until testing is complete, schools are advised to continue using bottled water and filtration as a precaution to protect children.

In addition, free testing is still available for any other Flint school, including daycares and Head Starts. Free testing is also available for any Flint resident.

Additional information, including more detailed lead screening results, is available at [www.michigan.gov/flintwater](http://www.michigan.gov/flintwater).

###



# ROWE PROFESSIONAL SERVICES COMPANY

*Large Firm Resources, Personal Attention.*

*Review of TYJT Report*

January 7, 2013

Mr. Edward Kurtz, Emergency Financial Manager  
City of Flint  
1101 S. Saginaw Street  
Flint, MI 48502

Subject: Review of December 21, 2012 Presentation -- City of Flint Water Supply Assessment

Dear Mr. Kurtz:

As requested, we have reviewed the analysis of water supply alternatives for the City of Flint which was presented to the State Department of Treasury by Tucker, Young, Jackson, and Tull, Inc. (TYJT) on December 21, 2012. Our review is attached and summarizes the primary differences between the TYJT assessment and our previous studies and provides explanations of why we believe there are differences.

We have also reviewed the options for continued DWSD supply included in the TYJT presentation. It is not clear whether these are presented as specific offers on behalf of DWSD or included as examples for analysis, but we have noted some items which we believe should be addressed and considered as these options are compared.

If there are questions, please contact me.

Sincerely,  
ROWE Professional Services Company

  
James E. Redding, P.E.  
Vice President / Director of Engineering

Attachment

R:\Projects\04C0102\Docs\Correspondence\Out\January 7 Kurtz.docx

**Review of TYJT December 21, 2012 Presentation  
City of Flint Water Supply Assessment  
Prepared by Rowe Professional Services Company**

**DWSD Supply (Slides 7 through 9)**

1. The 8 mgd maximum day supply by DWSD options can result in periods during the summer when most of the water to meet demands will be supplied by the City from the river. To aid in maintaining a consistent water quality, softening of the water from the river should be provided with this option, greatly increasing the City's costs.
2. Upgrades to Flint's WTP and dams will be needed for options requiring blending, since the WTP will be required to provide continuous, reliable service and compliance with recent surface water treatment regulations.
3. The rates for the options analyzed are shown on Slide 9 as "TYJT Estimates". Options and rates shown are different than presented by DWSD previously.

|                            | DWSD<br>11/29/2012 | TYJT<br>Estimates |
|----------------------------|--------------------|-------------------|
| 18 mgd Maximum Day - P&B   | \$16.24            | \$16.37           |
| 12 mgd Maximum Day - P&B   | \$16.30            | \$16.31           |
| 8 mgd Maximum Day - P&B    |                    | \$12.68           |
| 12 mgd Maximum Day - Imlay | \$14.38            | \$14.38           |
| 8 mgd Maximum Day - Imlay  |                    | \$11.11           |

4. Since the rates used in the analyses are shown as estimates, are they actual offers or just presented as "what if" scenarios?
5. We assume that the Imlay options are based on transfer of the 72" main through Lapeer County to Flint. The analyses show a capital cost of \$4.7 million; we assume that this is the proposed purchase / lease cost to Flint. This should be clarified along with pertinent details.
6. If the transmission main is transferred to Flint, what are Flint's responsibilities regarding service to the Lapeer County customers? If they remain DWSD customers, then Flint should receive some revenue for the use the main. It does not appear this is included in the TYJT analyses.
7. If the transmission main is transferred to Flint, we assume that the city will be responsible for the maintenance of the 50 year old main. The TYJT analysis did not include this.
8. Do the rates shown include the credit for "reliability" which had been discussed with DWSD?
9. If the point of commerce is changed from Baxter and Potter to Imlay, a new meter pit will be required. The cost of this does not appear to be included in the TYJT cost analyses.

### **Flint River Supply (Slide 10)**

1. If any of the "blending" options are chosen, it will be necessary to upgrade the Flint WTP and dams to provide reliable, continuous service and compliance with recent surface water treatment regulations.

### **Data Collected (Slide 14)**

1. The slide notes that Flint blending is based on DWSD supplying 2/3 and Flint supplying 1/3 of 12 MGD ADD. For the maximum day demand (18 mgd), if DWSD supplies a maximum of 8 mgd, Flint will supply 10 mgd or 56% of the total. However, such a large portion will make it more difficult to blend and achieve consistent water quality. Flint will need to soften water for these options.

### **Benchmarking Comparisons (Slide 16)**

1. The slide subtitles are "KWA O&M Inflation Factor" and "DWSD and Flint Rate Inflation Factor". It seems appropriate to benchmark O&M costs for the KWA, because future costs of service will be dependent on how operating costs are impacted by inflation. For Flint, it does not seem appropriate that "rate inflation" from other utilities be used to determine the impact of inflation on future cost of service. Rates are impacted by inflation, but also by other factors such as debt and customer base. O&M expenses and rates are different and care should be exercised not to mix the two during analyses. The TYJT analyses apply an inflation factor (based on rates from other utilities) to the Flint WTP operating expenses, which does not seem to be consistent.
2. The KWA will supply raw water; SOCWA and YUCA both supply finished water. Regulations impact the O&M for finished water suppliers but should not impact the KWA O&M. The use of data from SOCWA and YUCA does not seem like a comparable comparison with the KWA. Finished water suppliers will have increased costs due to regulatory compliance, which really are not due to "inflation" of the costs of wages, power, chemicals, etc.
3. DWSD has a history of rates to Flint and other suburban wholesale customers. Rates tend to be quite specific to each utility, based on much more than just the costs of operating and maintenance. It appears that DWSD historical rates have not been considered in projecting future DWSD rate increases.

### **Capital Financing (Slide 17)**

1. KWA bonds are planned to be general obligation bonds, backed by member counties.

### **O&M Inflation Factor (Slide 20)**

1. SOCWA and YUCA are finished water suppliers; ever-changing regulatory requirements will impact their operating costs more than a raw water supplier, such as KWA.
2. KWA will be a supplier of raw water. O&M costs should primarily be limited to power and labor; with a little chemical use for zebra mussel control. KWA will not provide treatment of the water.

3. The KWA study assumed power, labor, and chemical costs increase at an annual average of 3%. TYJT indicated this is too low and suggested 5%.
4. Following are examples of historical inflation, which support the 3% as a reasonable assumption for O&M expenses (not rates)
  - a. Labor- GCDC-WWS labor costs have increased at an annual average rate of 2.5% since 2003.
  - b. Electricity Rates in Michigan (per U.S. Energy Information Administration) have increased an average of 3.2% since 1999.
  - c. The U.S. Bureau of Labor Statistics indicates that the inflation rate over the last 30 years has been an average of 2.8%.

#### **Finished Water Rate Inflation (Slide 21)**

1. TYJT bases their assumptions for rate inflation on a survey of rates from three other water suppliers, but ignored the actual rate history of DWSD. TYJT assumed DWSD rate increases of 4.4% annually (if water is purchased from P&B) and 2.9% annually (if water is purchased from Imlay). Based on the actual charges by DWSD to Flint, DWSD historical rates are as follows:
  - a. 10 year increase in DWSD rates to Flint:: 10.5% annually
  - b. Average annual increase through 45 year history: 6.7%
2. Note that for the KWA analyses, an inflation factor has just been applied to power, labor, and chemicals. Although higher prices for labor, power, and chemicals impacts utility rates; rates are impacted by many other factors, many of which are not related to inflation. Rate inflation will likely be different than O&M inflation. Other factors impacting rates:
  - a. Debt – the amount of debt varies widely between utilities
  - b. Number of customers / quantity of water sold – there are many fixed expenses with a utility, that if are distributed amongst more users/more gallons sold will result in lower rates. Conversely, if there are fewer users or less water sold, the rates are higher. Assumptions regarding future water consumption will have a great impact on “rate inflation”.
3. Unlike KWA and Flint operating expenses which will increase over time based on inflation, the cost of continued DWSD service should be based on the inflation of DWSD rates, to include the increasing cost of other DWSD expenses such as debt and the impact of reduced customers / demands in addition to increasing O&M expenses.
4. Even though there could be a one-time reduction in DWSD rates through adopting the model contract, limiting peak demands, and or changing the point of commerce; it doesn't seem reasonable to assume that subsequent annual increases will only average 4.4% through the 30 year period of analysis. This is significantly less than historical performance (yet TYJT suggests that inflation for KWA O&M expenses will increase at almost double the rate of historical indicators).



### Capital Financing with Revenue Bonds (Slide 24)

1. Note that the KWA bonds will be general obligation bonds backed by the member counties.
2. The 2009 KWA Study assumed 6%, 25 year financing. The interest rate for planning was reduced in the 2012 Study update to 5%, which is still higher than if bonds were sold today.
3. Financial consultants determined the charges for purchasing capacity in the KWA supply based on the estimated project cost plus appropriate financing costs. Based on 60 units of capacity, \$538,764,000 will be generated for repayment of debt and project costs using the capacity charges in the KWA capacity agreement.  

|  |                     |
|--|---------------------|
| 25 years * 60 units * \$355,300 / unit = | \$532,950,000       |
| 3 years * 60 units * \$32,300 / unit =   | <u>\$ 5,814,000</u> |
|  | \$538,764,000       |
4. For a KWA project cost of \$272,421,558, total P&I is \$483 million. The difference of \$55,500,000 is available for financing expenses (capitalized interest, bond issuance costs, etc.) and additional contingencies.
5. Bond holder reserve is not a requirement for general obligation bonds.
6. TYJT assumed that 3% interest would be earned on the bond holder reserve during the 25 year bond period. Current interest rates are less than 1% and it seems inappropriate to assume such a high rate will be earned on retained funds.
7. Bondholder reserve, if provided, should be applied against the last couple of P&I payments. The TYJT did not apply it. This will reduce their project costs.

### KWA Construction (Slides 26 through 29)

TYJT has indicated that the KWA construction cost estimate is too low. The primary differences in cost estimates for the project appear to be the following components:

1. Pump Stations (Slide 27) – The TYJT estimate for the pump stations is more than double that used by the KWA (\$54,573,314 vs. \$24,618,080). KWA estimates were based on actual construction costs from recent projects completed by Genesee County within the last eight years.
  - a. 32mgd water pump station including two-10 MG ground storage tanks - \$13.4 million
  - b. 80 mgd wastewater pump station, 50 feet deep wetwell – \$8.3 million
  - c. 30 mgd wastewater pump station, 50 feet deep wetwell – \$9.4 million

The KWA budgeted amount seems reasonable for two pumping stations as currently planned and to be constructed in rural areas (not southeast Michigan).

2. Redundant Power – There is no need for redundant power; other provisions will provide reliability of supply.
3. Land – Preliminary engineering has continued so earlier budgets established for planning for land acquisition can be greatly reduced. Options have been obtained on all properties which must be

purchased, so purchase prices are known. It will be necessary to obtain easements for only two miles of pipeline construction. All land costs are now estimated at \$1.25 million.

4. Engineering, Legal, Administration & Contingencies

- a. The October 2012 KWA estimate provided an allowance of 25% of construction cost to cover engineering, legal, administration, and contingencies (ELAC). This was reduced from the 38% allowance used in the 2009 Study because ongoing planning and design have firmed up many of the details of the project, including:
  - i. The intake design has been completed and all regulatory permits obtained.
  - ii. The transmission main route has been determined. Meetings with road agencies have firmed up the requirements for construction and restoration within rights-of-way. Environmental review and permitting are in process.

- b. TYJT costs for Intake Crib, Pump Stations, and Transmission Mains (Slide 30) include a 30% allowance for ELAC. These allowances (from Slides 26 through 28) total \$72,139,566. In addition, Slide 30 provides the following additional ELAC costs in the project total:

|                                    |                   |
|------------------------------------|-------------------|
| Design Engineering / Pump Stations | \$16,939,581      |
| Construction Management            | \$14,434,410      |
| Administration                     | \$ 349,440        |
| Legal                              | <u>\$ 831,000</u> |
| Total                              | \$32,554,431      |

- c. Combining this with the \$72,139,566 totals \$104,693,997 or 43% of the estimated construction cost. We believe that such a high allowance for ELAC is not appropriate for a project of this magnitude where preliminary engineering and some design have already been completed.

**Cost Comparison (Slide 30)**

1. The TYJT pump station price is too high based on costs of similar projects; costs used by KWA are based on costs of recent local projects. The KWA estimate is believed to be sufficient for the proposed pumping stations.
2. Redundant power is not required; this does not need to be included in the TYJT estimate.
3. Land for LHPS – actual price is \$360,000
4. Design Engineering / PS and Transmission – KWA included engineering in the 25% ELAC allowance included in the \$207,752,895 estimated cost of transmission mains; TYJT included engineering in their 30% ELAC allowance included in the \$218,811,559 estimated cost. By adding \$16,939,581 for design engineering, \$14,434,609 for construction administration, \$349,440 for administration, and \$831,000; it seems that ELAC is being “double-counted”. The TYJT 43% allowance for ELAC seems unwarranted for a project with a great deal of preliminary and design engineering completed. The 25% KWA allowance is believed to be sufficient.
5. Easements and land (other than LHPS) should total \$1,140,000, based on current options and specific needs for easements.

### **Other Considerations – Redundancy/ Reliability (Slide 33)**

#### **1. Unfunded Mandates/ Future Regulations**

- a. The proposed KWA supply will deliver raw water; it is not anticipated to be affected by future changes to regulations. Regulations will impact the City of Flint with respect to treatment and/or distribution of finished water. The City will be subject to these requirements with any of the DWSD blending options, just as they will be responsible for them if supplied by KWA. Some compliance costs may actually be less with the higher quality Lake Huron water rather than Flint River water as the source.

#### **2. State Goals**

- a. The TYJT presentation indicates that creation of a new raw water supply is contrary to the governor's goals as suggested. However, the development of a new raw water supply provides new opportunities. Communities in Sanilac, St. Clair, and Lapeer counties will have the option to join a regional water supply and replace their small local supplies where limited supplies and high concentrations of arsenic have been a concern. The new water supply also provides great economic development opportunities. The raw water supplied by KWA will make a new commodity, raw water, available to the region. A large, low-cost supply of raw water can be a valuable resource for industries and agribusinesses. The development of a new water supply will also create construction jobs through the short term period of building the new water supply and subsequently over a longer period as new businesses and industries are developed in the area.
- b. The City of Flint and area communities will benefit as permanent jobs are created for operating and maintaining the local treatment facilities.

#### **3. Redundancy**

- a. We agree that the KWA and DWSD options are similar with respect to redundancy. Both provide the primary water supply; customers are responsible for their backup supply.

### **Other Considerations – Cost Slide 34**

#### **1. TYJT indicates that the DWSD 8 mgd supply option is the least cost alternative.**

- a. The TYJT analysis does not include the cost of needed upgrades to the City's WTP or increased operating costs in their analysis. During summer months, water from the river will need to be softened before blending. More than half of the water supplied will be provided from the river. When the cost of upgrades to the WTP and the increased operating costs (for softening) are added to the TYJT analysis, the KWA option is less than the DWSD 8 mgd option.

#### **2. For any of the DWSD "blending" options, upgrades will need to be made at the WTP to provide for continuous, reliable operation and compliance with new surface water treatment rules. Increased capital and operating costs for treating water from the river should be added to the TYJT costs for comparison with the other options.**

#### **3. Water from the river will require greater effort to treat than water from Lake Huron (more chemicals, power, and residuals). The TYJT analysis shows about the same O&M costs for the Flint WTP, regardless of water source. It seems that the WTP O&M costs for the KWA options should be reduced to reflect the savings from treating Lake Huron water.**

4. The TYJT presentation noted that the KWA analysis did not include allowances for mechanical and process improvements within the planning period. The KWA will supply raw water. The facilities consist of pipe, pumps, and a tank. There are no treatment facilities which would be susceptible to future regulatory changes. The only improvements that seem likely would be the need to provide additional capacity. Capacity expansion is planned to be financed through capacity charges to new users.
5. The provision for redundant connections between the City's water system and the GCDC system was included in the most recent water supply agreement between the two, in 2011. Although not a KWA cost, the cost of the redundant connections should be considered with all options.
6. The \$2.3 million budgeted for land by KWA was intended to cover all land requirements. Since the October update, options have been obtained on all land to be purchased and the locations of easements needed has been finalized. Total land costs are now estimated to be about \$1.5 million.
7. The 2004 study included a 47% allowance for engineering, legal, administration, and contingencies (ELAC). The 2009 study reduced the allowance for ELAC to 37% because many of the details since the 2004 conceptual study had been better defined. For the October 2012 update, the allowance for ELAC was reduced to 25% because continued planning and preliminary engineering further addressed details from the earlier concepts.
  - a. The detailed design (plans and specifications) and permitting have been completed.
  - b. The transmission main route has been finalized. Meetings with road agencies have established requirements for construction and restoration within road rights-of-way. Environmental permitting is in process. The primary remaining unknown is pipe sizing, which is largely dependent on Flint's participation.

It is our experience that the 25% ELAC allowance is appropriate for a project of this magnitude at this stage in the planning / design stage. The 43% ELAC allowance recommended by TYJT is excessive for a project in the design phase.

8. Flint's WTP as a backup to the KWA will be less difficult to provide for than the current arrangement as a backup to DWSD. We believe there is potential for challenges with chemistry and treatment for the proposed DWSD blending options, too.
9. It doesn't seem that oversizing the KWA capacity is a good solution for the city's water loss problems, if that is what is being suggested.
10. Yes, it would be nice if the KWA system could be constructed to firmly determine its cost and time to complete before making a decision about water supply alternatives. However, a decision is needed regarding Flint's participation so that the sizing and design can be completed, before it can be built.

**Project Costs - TYJT Slides 26 through 30**

|                                   | KWA           | TYJT          |
|-----------------------------------|---------------|---------------|
| Intake and Crib                   |               |               |
| Construction                      | \$22,076,850  | \$22,076,850  |
| ELAC                              | \$5,519,213   | \$5,519,213   |
| Property                          | \$2,300,000   | \$2,300,000   |
| Pumping Stations                  |               |               |
| Construction                      | \$24,618,080  | \$54,573,314  |
| Land                              |               | \$75,000      |
| ELAC                              | \$6,154,520   | \$16,394,494  |
| Transmission Mains                |               |               |
| Construction                      | \$166,202,316 | \$167,419,530 |
| ELAC                              | \$41,550,579  | \$50,225,859  |
| Easements                         |               | \$1,166,170   |
| Engineering                       |               |               |
| Design Engineering                |               | \$16,939,581  |
| Construction Management           |               | \$14,434,609  |
| Administration                    |               | \$349,440     |
| Legal / Easements / Contracts     |               | \$831,000     |
| Power                             | \$4,000,000   | \$4,000,000   |
| Redundant Power                   |               | \$1,273,200   |
| Total Construction                | \$212,897,246 | \$244,069,694 |
| Total ELAC                        | \$53,224,312  | \$104,694,196 |
| Total Land / Property / Easements | \$2,300,000   | \$3,541,170   |
| Total Power                       | \$4,000,000   | \$4,000,000   |
| Total Redundant Power             | \$0           | \$1,273,200   |
| Total                             | \$272,421,558 | \$357,578,260 |
| ELAC as % of Construction         | 25.0%         | 42.9%         |

| Option                         | TYJT Total Cost | TYJT minus additional costs of river treatment | TYJT minus additional costs of river treatment plus redundant connections Flint-GCDC connections | TYJT minus additional costs of river treatment plus redundant connections less KWA reserve | TYJT minus additional costs of river treatment plus redundant connections less TYJT financing | TYJT plus Flint WTP | Adjusted Total Cost | Ranking |
|--------------------------------|-----------------|--|--|--|---|---------------------|---------------------|---------|
| 1 Flint WTP Only               | \$590,441,893   |  |  |  |   |                     | \$590,441,893       | 3       |
| 2 DWSD 8 MGD Max Day at Imlay  | \$621,211,298   |  |  |  |   | \$771,289,948       | \$771,289,948       | 5       |
| 3 KWA 10/31/12 Update          | \$649,775,166   | \$534,615,996                                  | \$554,555,960  |  |   |                     | \$554,555,960       | 1       |
| 4 DWSD 8 MGD Max Day at P&B    | \$657,167,877   |  |  |  |   | \$807,246,527       | \$807,246,527       | 6       |
| 5 KWA-1                        | \$707,279,715   | \$592,120,545                                  | \$612,060,509  |  | \$572,731,459   |                     | \$572,731,459       | 2       |
| 6 DWSD 12 MGD Max Day at Imlay | \$707,994,386   |  |  |  |   | \$858,073,036       | \$858,073,036       | 8       |
| 7 DWSD 12 MGD Max Day at P&B   | \$742,168,081   |  |  |  |   | \$892,246,731       | \$892,246,731       | 9       |
| 8 KWA - 2                      | \$766,784,313   | \$651,625,143                                  | \$671,565,107  | \$654,706,341  |   |                     | \$654,706,341       | 4       |
| 9 DWSD 18 MGD Max Day at P&B   | \$791,202,885   |  |  |  |   | \$812,337,848       | \$812,337,848       | 7       |

| Option for Water Supply        | TYJT Projected 30 Year Total Cost | 30 Year O&M Reduction for Treating Lake Huron Water | 25 Year Bond Cost for Redundant Connections | Eliminate KWA Reserve | Use KWA 25 Year Capital Charge \$355,300 / MGD | 25 Year Bond Cost for Flint WTP Upgrades | Adjusted 30 Year Total Cost | Rank (Least to Highest Cost) |
|--------------------------------|-----------------------------------|---|---|-----------------------|--|--|-----------------------------|------------------------------|
| 1 Flint WTP Only               | \$590,441,893                     |   | Included                                    |                       |  |  | \$590,441,893               | 3                            |
| 2 DWSD 8 MGD Max Day at Imlay  | \$621,211,298                     |   | Note 1                                      |                       |  | \$150,078,650                            | \$771,289,948               | 5                            |
| 3 KWA 10/31/12 Update          | \$649,775,166                     | -\$115,159,170                                      | \$21,134,963                                |                       |  |  | \$555,750,960               | 1                            |
| 4 DWSD 8 MGD Max Day at P&B    | \$657,167,877                     |   | Note 1                                      |                       |  | \$150,078,650                            | \$807,246,527               | 6                            |
| 5 KWA-1                        | \$707,279,715                     | -\$115,159,170                                      | \$21,134,963                                |                       | -\$39,329,050                                  |  | \$573,926,459               | 2                            |
| 6 DWSD 12 MGD Max Day at Imlay | \$707,994,386                     |   | Note 1                                      |                       |  | \$150,078,650                            | \$858,073,036               | 8                            |
| 7 DWSD 12 MGD Max Day at P&B   | \$742,168,081                     |   | Note 1                                      |                       |  | \$150,078,650                            | \$892,246,731               | 9                            |
| 8 KWA - 2                      | \$766,784,313                     | -\$115,159,170                                      | \$21,134,963                                | -\$16,858,766         |  |  | \$655,901,341               | 4                            |
| 9 DWSD 18 MGD Max Day at P&B   | \$791,202,885                     |   | \$21,134,963                                |                       |  |  | \$812,337,848               | 7                            |

### Representative Genesee County Water and Wastewater Projects

| Project           | Description   | All Engineering Fees | Engineer's Estimate | Bid Price    | Final Construction Cost | Engineering & Contingency % |
|-------------------|---|----------------------|---------------------|--------------|-------------------------|-----------------------------|
| Fox Pump Station  | 30 mgd wastewater pump station & forcemain                              | \$1,829,259          |                     | \$12,394,273 | \$12,074,223            |                             |
|                   |   | 15.2%                |                     |              |                         |                             |
| NEES Project      | 60" Relief Sewer - included tunneled sections                           |                      | \$54,707,212        | \$55,985,672 | \$69,999,429            |                             |
|                   |   |                      |                     |              | 28.0%                   |                             |
| North Water Loop  | 23 miles 36" and 48" transmission main, pump station, & 20 MG Reservoir | \$4,102,610          | \$29,200,000        | \$23,570,110 | \$25,798,529            | 2.4%                        |
|                   |   | 15.9%                |                     |              | 11.6%                   |                             |
| Henderson Road PS | 32 MGD Water Pump Station & Two 10 MG Tanks                             |                      | \$12,046,368        | \$12,846,077 | \$13,517,582            |                             |
|                   |   |                      |                     |              | 12.2%                   |                             |
| Pump Station #1   | 80 MGD wastewater pump station  | \$1,735,063          | \$10,269,000        | \$8,225,400  | \$8,292,277             | 2.4%                        |
|                   |   | 20.9%                |                     |              | 19.2%                   |                             |

**Notes:**

Engineering Fees include all planning, soils investigation, design, construction inspection & testing, and construction management costs

Engineering Fees % is based on final construction cost

Engineering and Contingency % is based on engineering fees + amount final construction cost exceeds estimate

Final Construction Cost % is based on difference between final construction cost and engineer's estimate

NEES Project Contractor went out of business during project - increasing cost to finish project

Projects constructed within last ten years

## - Financing for KWA

- Flint + GEDC full path + credit
- ~~will~~ limit on Genesee pledge
- Flint Financial Position

↳ GEDC

legal says

- Genesee can't unless

Flint is under a consent order to make necessary improvements

will provide  
draft language

Improvements Needed to  
connect Flint to KWA + use

- transmission line
- WTP improvements (1st priority)

Jerry 810-766-7246  
ext 2501

517-230-9793





## Michigan Department of Environmental Quality

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**Replicate Laboratory Report for  
Lansing Drinking Water Laboratory**

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Owner/Location Information:

CITY OF FLINT  
212 BROWNING AVE  
FLINT MI 48507

Sample Number: LLF54944

Sample/Collection Information:

WSSN: 02310

County: Genesee

Township:

Section:

Well #: 

Collection Date: 2/11/2015 10:20:00 AM

Arrival Date: 2/19/2015 11:13:00 AM

Site Code:

Water Source: Public Community Water Supply

Sample Reason: Other

Sample Point: Treated Public Distribution System

Point Description: BATHROOM T

Collector: Public Water Supply Operator

Collected By: MIEK GLASGOW

---

| <u>CasNo</u> | <u>Analyte</u>       | <u>Result</u> | <u>Detect</u> | <u>Units</u> | <u>Method</u> |
|--------------|----------------------|---------------|---------------|--------------|---------------|
| 7440-50-8    | COPPER (RECOVERABLE) | 0.11          | 0.05          | mg/L         | EPA 200.8     |
| 7439-89-6    | IRON                 | 1.63          | 0.02          | mg/L         | EPA 200.8     |
| 7439-96-6    | MANGANESE            | 0.18          | 0.01          | mg/L         | EPA 200.8     |
| 7440-66-6    | ZINC                 | 0.20          | 0.01          | mg/L         | EPA 200.8     |

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## Laboratory Comments:

By authority of PA 366 of 1976 as amended:

Print Date: Tue Aug 4 11:50:49 EDT  
2015



## Michigan Department of Environmental Quality

Replicate Laboratory Report for  
Lansing Drinking Water LaboratoryOwner/Location Information:CITY OF FLINT  
212 BROWNING AVE  
FLINT MI 48507

Sample Number: LLF54945

Sample/Collection Information:

WSSN: 02310

County: Genesee

Township:

Section:

Well #:

Collection Date: 2/18/2015 7:15:00 AM

Arrival Date: 2/19/2015 11:13:00 AM

Site Code:

Water Source: Public Community Water Supply

Sample Reason: Routine Monitoring

Sample Point: Treated Public Distribution System

Point Description: KITCHEN

Collector: Private Citizen

Collected By: LEANNE WALTERS

| <u>CasNo</u> | <u>Analyte</u>       | <u>Result</u> | <u>Detect</u> | <u>Units</u> | <u>Method</u> |
|--------------|----------------------|---------------|---------------|--------------|---------------|
| 7440-50-6    | COPPER (RECOVERABLE) | ND            | 0.05          | mg/L         | EPA 200.8     |
| 7439-92-1    | LEAD (TOTAL)         | 0.104         | 0.001         | mg/L         | EPA 200.8     |

## Laboratory Comments:

By authority of PA 368 of 1978 as amended.

Print Date: Tue Aug 4 11:50:28 EDT  
2015

104  
- Tier 1? Yes  
- In home treatment  
- Signed Form



## Michigan Department of Environmental Quality

**Replicate Laboratory Report for  
Lansing Drinking Water Laboratory**Owner/Location Information:

CITY OF FLINT  
212 BROWNING AVE  
FLINT MI 48507

Sample Number: LLF56229

Sample/Collection Information:

WSSN: 02310

County: Genesee

Township:

Section:

Well #:

Collection Date: 2/25/2015 10:26:00 AM

Arrival Date: 3/6/2015 11:34:24 AM

Site Code:

Water Source: Single Family Dwelling

Sample Reason: Water Quality Problem

Sample Point: Treated Public Distribution System

Point Description: KITCHEN

Collector: Public Water Supply Operator

Collected By: MIKE GLASGOW

| <u>CasNo</u> | <u>Analyte</u>   | <u>Result</u> | <u>Detect</u> | <u>Units</u> | <u>Method</u> |
|--------------|------------------|---------------|---------------|--------------|---------------|
| 7440-38-2    | ARSENIC (TOTAL)  | ND            | 0.002         | mg/L         | EPA 200.8     |
| 7440-39-3    | BARIUM           | 0.01          | 0.01          | mg/L         | EPA 200.8     |
| 7440-41-7    | BERYLLIUM        | ND            | 0.0004        | mg/L         | EPA 200.8     |
| 7440-43-9    | CADMIUM (TOTAL)  | ND            | 0.0003        | mg/L         | EPA 200.8     |
| 7440-47-3    | CHROMIUM (TOTAL) | ND            | 0.01          | mg/L         | EPA 200.8     |
| 7439-97-6    | MERCURY          | ND            | 0.0001        | mg/L         | EPA 200.8     |
| 7440-02-0    | NICKEL           | ND            | 0.01          | mg/L         | EPA 200.8     |
| 7439-92-1    | LEAD (TOTAL)     | ND            | 0.001         | mg/L         | EPA 200.8     |
| 7440-35-0    | ANTIMONY         | ND            | 0.0006        | mg/L         | EPA 200.8     |
| 7782-49-2    | SELENIUM (TOTAL) | ND            | 0.001         | mg/L         | EPA 200.8     |
| 7440-28-0    | THALLIUM         | ND            | 0.0002        | mg/L         | EPA 200.8     |

Laboratory Comments:

By authority of PA 368 of 1978 as amended.

Print Date: Tue Aug 4 11:51:25 EDT  
2015



## Michigan Department of Environmental Quality

**Replicate Laboratory Report for  
Lansing Drinking Water Laboratory**Owner/Location Information:CITY OF FLINT  
212 BROWNING AVE  
FLINT MI 48507

Sample Number: LLF56224

Sample/Collection Information:

WSSN: 02310

County: Genesee

Township:

Section:

Well #:

Collection Date: 3/3/2015 6:00:00 AM

Arrival Date: 3/6/2015 11:33:07 AM

Site Code:

Water Source: Single Family Dwelling

Sample Reason: Other

Sample Point: Treated Public Distribution System

Point Description: KITCHEN ✓

Collector: Private Citizen

Collected By: LEEANNE WALTERS

| <u>CasNo</u> | <u>Analyte</u>       | <u>Result</u> | <u>Detect</u> | <u>Units</u> | <u>Method</u> |
|--------------|----------------------|---------------|---------------|--------------|---------------|
| 7440-50-8    | COPPER (RECOVERABLE) | ND            | 0.05          | mg/L         | EPA 200.8     |
| 7439-92-1    | LEAD (TOTAL)         | 0.397         | 0.001         | mg/L         | EPA 200.8     |

## Laboratory Comments:

By authority of PA 368 of 1978 as amended.

Print Date: Tue Aug 4 11:51:37 EDT  
2015

- Tier 1? ✓  
- In home treat? ✓  
- Signed Form ✓



## Michigan Department of Environmental Quality

**Replicate Laboratory Report for  
Lansing Drinking Water Laboratory**Owner/Location Information:CITY OF FLINT  
212 BROWNING AVE  
FLINT MI 48507

Sample Number: LLF59748

Sample/Collection Information:

WSSN: 02310

County: Genesee

Township:

Section:

Well #:

Collection Date: 4/2/2015 8:00:00 AM

Arrival Date: 4/14/2015 11:07:48 AM

Site Code:

Water Source: Single Family Dwelling

Sample Reason: Other

Sample Point: Treated Public Distribution System

Point Description: PRE P O S

Collector: Private Citizen

Collected By: LEEANNE WALTERS

| <u>CasNo</u> | <u>Analyte</u>       | <u>Result</u> | <u>Detect</u> | <u>Units</u> | <u>Method</u> |
|--------------|----------------------|---------------|---------------|--------------|---------------|
| 7440-50-8    | COPPER (RECOVERABLE) | 0.11          | 0.05          | mg/L         | EPA 200.8     |
| 7439-92-1    | LEAD (TOTAL)         | 0.707         | 0.001         | mg/L         | EPA 200.8     |

Laboratory Comments:

By authority of PA 368 of 1978 as amended.

Print Date: Tue Aug 4 11:50:59 EDT  
2015



## Michigan Department of Environmental Quality

Replicate Laboratory Report for  
Lansing Drinking Water LaboratoryOwner/Location Information:CITY OF FLINT  
212 BROWNING AVE  
FLINT MI 48507

Sample Number: LLF57729

Sample/Collection Information:

WSSN: 02310

County: Genesee

Township:

Section:

Well #:

Collection Date: 3/18/2015 11:10:00 AM

Arrival Date: 3/24/2015 11:05:23 AM

Site Code:

Water Source: Single Family Dwelling

Sample Reason: Other

Sample Point: Treated Public Distribution System

Point Description: KITCHEN

Collector: Public Water Supply Operator

Collected By: MIKE GLASGOW

| <u>CasNo</u> | <u>Analyte</u>       | <u>Result</u> | <u>Detect</u> | <u>Units</u> | <u>Method</u> |
|--------------|----------------------|---------------|---------------|--------------|---------------|
| 7440-50-8    | COPPER (RECOVERABLE) | ND            | 0.05          | mg/L         | EPA 200.8     |
| 7439-92-1    | LEAD (TOTAL)         | 0.004         | 0.001         | mg/L         | EPA 200.8     |

Laboratory Comments:

By authority of PA 366 of 1978 as amended.

Print Date: Tue Aug 4 11:51:13 EDT  
2015

- Hold Time? Not Met  
- In Home Treatment  
- Tier 1?

- Darren + Mike

Confirmed that  $PO_4$  vs. P  
↑ EPA based on  $PO_4$

3-4  $PO_4$  mg/L  $\rightarrow$   $\approx$  1 mg P/L

$\approx$  12 mg/L  $PO_4$  DWSD Litteron Census?

25 WQP sites

EPA "There are multiple definitions of optimized in the LCR"

- Confirmation Sampling for lead service lines
- create a test loop to confirm effectiveness

EPA

KWA

1:45 conf call

9/27/2015

Tom Burke 202-

**PPI**

\* CCT

~ flush

- EPA protocol

Send

burke.thomas@epa.gov

- Sampling protocol
  - history
  - extra sample
- 

Lead / CCT



## Busch, Stephen (DEQ)

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Thursday, November 19, 2015 6:16 PM  
**To:** lytle.darren@epa.gov; Schock, Michael (Schock.Michael@epa.gov)  
**Cc:** Sygo, Jim (DEQ) (SygoJ@michigan.gov); Robert Kaplan (kaplan.robert@epa.gov); prysbym@michigan.gov; George Krisztian (krisztiang@michigan.gov); Richard Benzie P.E. (BENZIER@michigan.gov); burke.thomas@epa.gov  
**Subject:** Corrosion Control Treatment Example Study  
**Attachments:** Flint CCT Operation Letter 10-30-15.pdf; image2015-11-03-155158.pdf

Darren and Mike,

The City of Flint and their engineering consultant would like EPA to provide a previously approved example of an optimal corrosion control treatment evaluation completed for a water treatment plant when full scale testing of the new source water was not available.

This is in an effort to assist the City of Flint regarding the required corrosion control treatment evaluation of the City's future change in source water to Lake Huron supplied by the Karegnondi Water Authority at the City of Flint Water Treatment Plant, as outlined in the Department's October 30, 2015 letter to the City, and in accordance with the November 3, 2015, EPA Memorandum *Lead and Copper Rule Requirements for Optimal Corrosion Control Treatment for Large Drinking Water Systems*, both attached.

While the later part of the EPA memo discusses systems that plan to disconnect from a supplier that had installed corrosion control treatment to determine the OCCT for the new source (and in the case of the City of Flint, new treatment), the guidance document that is referenced in this memo appears to focus only on existing systems where full-scale treatment evaluation is possible, with no apparent guidance for new systems or systems that disconnect from their supplier prior to their source and treatment change.

Your assistance regarding this matter is greatly appreciated.

Stephen Busch, P.E.  
MDEQ Lansing District Coordinator  
Office of Drinking Water and Municipal Assistance  
Lansing and Jackson District Supervisor  
517-643-2314  
[buschs@michigan.gov](mailto:buschs@michigan.gov)

**Prysby, Mike (DEQ)**

---

**From:** Michael Glasgow <mglasgow@cityofflint.com>  
**Sent:** Tuesday, September 09, 2014 9:47 AM  
**To:** Prysby, Mike (DEQ); Busch, Stephen (DEQ); Rosenthal, Adam (DEQ)  
**Cc:** Brent Wright; Daugherty Johnson; Howard Croft  
**Subject:** September 2014 Boil Water Notice Timeline  
**Attachments:** Boil Water Advisory Event Timeline # 2.docx

Gentlemen,

Attached is a timeline of events that led us to the recent boil water notice. It shows all sampling and results from 9/2 thru today.

FYI:

I was just talking with a couple of employee's from the Water Service Center who have been helping us with our investigation of the the distribution system. It seems that they have found one of the possible causes of our recent issues. A 36" transmission main not far west of the treatment plant had a valve that was closed, and the 24" transmission main that leads west also has a valve that is closed. The 36" valve was opened, however the valve on the 24" is inoperable. With these valves closed, it appears the water leaving the plant has no direct route to the west side of the city (or the West Side Reservoir)

Mike Glasgow  
City of Flint Water Plant

## City of Flint Boil Water Advisory Event Timeline (Sept. 2014)

September 2<sup>nd</sup> – Routine distribution sampling yielded 1 sample positive for coliform bacteria.

| Sample Site | Address           | Free Chlorine | Total Chlorine |
|-------------|-------------------|---------------|----------------|
| # 5         | 2501 Flushing Rd. | 0.0           | 0.1            |

September 3<sup>rd</sup> – Distribution repeat sampling along with upstream and downstream locations yielded 2 samples positive for coliform bacteria.

| Sample Site    | Address           | Free Chlorine | Total Chlorine |
|----------------|-------------------|---------------|----------------|
| # 5            | 2501 Flushing Rd. | 0.0           | 0.2            |
| # 5 Upstream   | 1117 N. Chevrolet | 0.0           | 0.2            |
| # 5 Downstream | 2740 Flushing Rd. | 0.1           | 0.3            |

September 4<sup>th</sup> – Sampling yielded four samples positive for coliform bacteria. Sampling included Site # 5 repeat sampling and the City Distribution sampling.

| Sample Site    | Address           | Free Chlorine | Total Chlorine |
|----------------|-------------------|---------------|----------------|
| # 5            | 2501 Flushing Rd. | 0.1           | 0.2            |
| # 5 Upstream   | 2205 Flushing Rd. | 0.1           | 0.2            |
| # 5 Downstream | 2740 Flushing Rd. | 0.1           | 0.3            |
| # 6            | 3216 MLK Blvd.    | 0.1           | 0.2            |

September 5<sup>th</sup> – Notified DEQ of recent results. Resampled Site # 5 & # 6 along with upstream & downstream locations. Site # 5 and its downstream locations were positive for coliform bacteria. Site # 6 upstream & downstream locations were also positive for coliform bacteria. DEQ requires boil water notice to be issued tonight.

| Sample Site    | Address           | Free Chlorine | Total Chlorine |
|----------------|-------------------|---------------|----------------|
| # 5            | 2501 Flushing Rd. | 0.1           | 0.2            |
| # 5 Upstream   | 2205 Flushing Rd. | 0.1           | 0.3            |
| # 5 Downstream | 2740 Flushing Rd. | 0.1           | 0.2            |
| # 6            | 3216 MLK Blvd.    | 0.2           | 0.3            |
| # 6 Upstream   | 3317 MLK Blvd.    | 0.1           | 0.2            |
| # 6 Downstream | 3110 MLK Blvd.    | 0.1           | 0.2            |

September 6<sup>th</sup> – Resampled Site # 5 & # 6 along with upstream & downstream locations. All samples were negative for coliform bacteria. Site #6 was closed, alternate site used.

| Sample Site    | Address             | Free Chlorine | Total Chlorine |
|----------------|---------------------|---------------|----------------|
| # 5            | 2501 Flushing Rd.   | 0.2           | 0.3            |
| # 5 Upstream   | 2205 Flushing Rd.   | 0.2           | 0.3            |
| # 5 Downstream | 1274 Ballenger Hwy. | 0.1           | 0.2            |
| # 6 (alt)      | 104 E. Pasadena     | 0.1           | 0.2            |
| # 6 Upstream   | 3317 MLK Blvd.      | 0.2           | 0.3            |
| # 6 Downstream | 3110 MLK Blvd.      | 0.0           | 0.1            |

September 7<sup>th</sup> – Resampled Site # 5 & # 6 along with upstream & downstream locations. Site #6 was closed, alternate site used.

| Sample Site    | Address            | Free Chlorine | Total Chlorine |
|----------------|--------------------|---------------|----------------|
| # 5            | 2501 Flushing Rd.  | 0.2           | 0.3            |
| # 5 Upstream   | 2205 Flushing Rd.  | 0.2           | 0.3            |
| # 5 Downstream | 1274 Ballenger Hwy | 0.0           | 0.2            |
| # 6 (alt)      | 104 E. Pasadena    | 0.1           | 0.3            |
| # 6 Upstream   | 3317 MLK Blvd.     | 0.1           | 0.3            |
| # 6 Downstream | 3110 MLK Blvd.     | 0.2           | 0.3            |

September 8<sup>th</sup> – Sampled all 10 sites in the distribution sampling plan, including Site # 5 downstream which was positive on the 7<sup>th</sup>.

| Sample Site         | Address             | Free Chlorine | Total Chlorine |
|---------------------|---------------------|---------------|----------------|
| # 1                 | 3742 Davison Rd.    | 0.1           | 0.2            |
| # 2                 | 822 S. Dort Hwy     | 0.2           | 0.4            |
| # 3                 | 3302 S. Dort Hwy    | 0.1           | 0.1            |
| # 4                 | 3606 Corunna Rd.    | 0.0           | 0.2            |
| # 5                 | 2501 Flushing Rd.   | 0.1           | 0.2            |
| # 6                 | 3216 MLK Blvd.      | 0.1           | 0.1            |
| # 7                 | 5018 Clio Rd.       | 0.1           | 0.1            |
| # 8                 | 6204 N. Saginaw St. | 0.7           | 1.0            |
| Cedar St. Reservoir | 1100 Cedar St       | 0.6           | 0.9            |
| West Side Reservoir | 1416 Dupont St.     | 0.7           | 1.0            |
| # 5 Downstream      | 1274 Ballenger Hwy  | 0.1           | 0.1            |

Sample results will be available @ 2pm on 9/9/15.

## Surge Analysis

- Pipe Size Study
- Hyd. Area for each contract (4) 60" x 66" pipe alt.
- Plant location
- Type of Pipe (Steel) C. station
- Max. Pressure 250 psi + 100 psi surge

L. Aaron  $\rightarrow$  Int. 14,200

Int.  $\rightarrow$  WTP 92,000 / 50 psi

## Pressure

- Pressure Class
- Lowest Pressure
- Add Surges to Maximum Surge

350-500 psi w/out Appliances

Potential to upsize & eliminate  
90% final locations

## KWA Mtg.

- Dave
- John O'Brien
- John O'Mahon
- Elgin Brown
- Blenheim
- Busch
- Pinsky

Nov 18 referendum expires

petition to call for vote (need 10% of pop)  
Signatures

possible delay by 6 months

take gas paper Flint borrow from water fund

---

- Eliminate Cl gas at both sites

15 May

< VE Done

Lake Station -

Well Well Etc based on intake

Dual Trach

Travel Surcs on 1, static on 1

can <sup>↑</sup> really to travel in future

■ Pirm (6 MG) - (3 or 4 pigs)

1-30-35 MG

3-60-70 MG

shutoff 600-700 ft



**Briefing: Flint Water System Press Conference**

Thursday, Oct. 8, 2015

Mott Foundation/Commerce Center Building Ground Floor

519 S. Saginaw St., Flint

Communications: Sara Wurfel, 517-599-3470, [wurfels@michigan.gov](mailto:wurfels@michigan.gov)

Dave Murray, 517-449-8343, [murrayd1@michigan.gov](mailto:murrayd1@michigan.gov)

**Purpose:**

We're announcing the decision to reconnect Flint to the Detroit Water and Sewerage Department, a collaborative effort between the state government, Flint city government and the Mott Foundation.

**High level points:**

- Protecting the health and safety of our residents in Flint and across Michigan is always our top priority.
  - All Michigan residents need access to safe, clean water.
- That's why today, in consultation with health and water experts in our state agencies, I'm advocating reconnecting the Flint drinking water with the Great Lakes Water Authority.
- I'm recommending to my partners in the Legislature that the state government provide \$6 million of the needed \$12 million to reconnect with authority.
  - The Flint city government has agreed to cover \$2 million of this cost, and the Charles Stewart Mott Foundation is generously offered to donate \$4 million.
- What you are seeing here today is a community coming together to work toward solving a problem.
  - I appreciate the assistance of Mayor Walling, and the U.S. Environmental Protection Agency.
  - This is a collaborative approach, and I appreciate that community organizations including the United Way and come forward to assist.

**Agenda:**

|                     |  |
|---------------------|--|
| 9:00 AM - 9:45 AM   | Gov meets with Mayor Walling in [Room 1]                       |
| 9:45 AM - 10:00 AM  | Pre-Brief in [Room 2]  |
| 10:00 AM - 10:01 AM | Harvey Hollins kicks off press conference; introduces Governor |
| 10:01 AM - 10:05 AM | Governor gives remarks   |
| 10:05 AM - 10:06 AM | Harvey Hollins introduces Mayor Dayne Walling                  |
| 10:06 AM - 10:10 AM | Mayor Walling gives remarks                                    |
| 10:10 AM - 10:11 AM | Harvey Hollins introduces DEQ Director Dan Wyant               |
| 10:11 AM - 10:15 AM | Director Wyant gives remarks                                   |
| 10:15 AM - 10:16 AM | Harvey Hollins introduces DHHS Director Nick Lyon              |
| 10:16 AM - 10:17 AM | Director Nick Lyon introduces Dr. Eden Wells                   |
| 10:17 AM - 10:20 AM | Dr. Eden Wells remarks   |
| 10:20 AM - 10:21 AM | Harvey Hollins introduces Ridgway White of Mott Foundation     |
| 10:21 AM - 10:25 AM | Ridgway White gives remarks                                    |
| 10:25 AM - 10:35 AM | Q&A from the podium  |
| 10:35 AM            | Event concludes; Governor departs                              |

**Attendees:** Roughly 20 in audience

|        |         |                          |
|--------|---------|--------------------------|
| Susan  | Borrego | Chancellor, U of M Flint |
| Oscar  | Overton | Pastor                   |
| Alfred | Harris  | Pastor                   |



|            |          |                                    |
|------------|----------|------------------------------------|
| Latrelle   | Holmes   | Pastor                             |
| Jim        | Ananich  | Michigan Senate                    |
| Sheldon    | Neely    | Michigan House                     |
| Phil       | Phelps   | Michigan House                     |
| Jeff       | Wright   | Drain Commissioner, Genesee County |
| Amy        | Hovey    | Dan Kildee office                  |
| Jamie      | Gaskin   | Dan Kildee office                  |
| Tim        | Herman   | Flint Chamber of Commerce          |
| Brian      | Larkin   | Flint Chamber of Commerce          |
| Eric       | Mays     | Flint City Council                 |
| Jacqueline | Poplar   | Flint City Council                 |
| Kerry      | Nelson   | Flint City Council                 |
| Joshua     | Freeman  | Flint City Council                 |
| Wantwaz    | Davis    | Flint City Council                 |
| Herbert    | Winfrey  | Flint City Council                 |
| Monica     | Galloway | Flint City Council                 |
| Vicki      | VanBuren | Flint City Council                 |
| Scott      | Kincaid  | Flint City Council                 |

#### Speaker comments:

RDS – Collaboration led to solution, outline of solution

Mayor Walling – Importance of solution to Flint

Dan Wyant – School testing results, overview of steps on transition from Flint River to DWSD

Nick Lyon – DHHS involvement

Dr. Eden Wells – Testing of water going forward, use of filters approved by NSF

Ridgway White – Importance of collaboration/commitment to Flint

#### Talking points:

- Protecting the health and safety of our residents in Flint and across Michigan is always our top priority.
  - All Michigan residents need access to safe, clean water
- That's why today, in consultation with health and water experts in our state agencies, I'm advocating reconnecting the Flint drinking water with the Great Lakes Water Authority.
- I'm recommending to my partners in the Legislature that the state government provide \$6 million of the needed \$12 million to reconnect with authority.
  - The Flint city government has agreed to cover \$2 million of this cost, and the Charles Stewart Mott Foundation is generously offered to donate \$4 million.
  - The Michigan Department of Health and Human Services and the Department of Environmental Quality today also is committing an additional \$3.5 million for water filters, free lead testing through the state laboratory for Flint water customers, and hiring additional staff to conduct health exposure monitoring for lead in drinking water.
- What you are seeing here today is a community coming together to work toward solving a problem.
  - I appreciate the assistance of Mayor Walling, and the U.S. Environmental Protection Agency.
  - This is a collaborative approach, and I appreciate that community organizations including the United Way and come forward to assist.
- Today's announcement is an important step as we move forward together.
  - But it is not our first step, nor will it be our last.

- This announcement builds on work we've already set in place.
  - That includes \$4.2 million in state grants and loan restructuring to help identify and fix infrastructure problems.
  - State agencies have been working closely with Flint leaders and the community for more than a year.
- There will be more to do.
  - Flint has an aging water infrastructure system with challenges that we – together – will continue to address.
- We will continue to test Flint schools for lead levels in drinking water.
  - Schools across the state might also have questions.
  - The Department of Environmental Quality will work with districts across the state to provide testing.
    - Districts can send water samples and paperwork and the nominal charge. (It costs \$26 per sample).
- The steps outlined in the comprehensive action plan are still in effect.



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING



DAN WYANT  
DIRECTOR

September \*\*, 2015

The Honorable Daniel T. Kildee  
United States House of Representatives  
Washington, DC 20515

Dear Representative Kildee:

Thank you for your letter of September 9, 2015, regarding water quality in the city of Flint (City). Your interest in this matter is appreciated. The Michigan Department of Environmental Quality (MDEQ) considers its responsibility to ensure safe drinking water for its citizens a top priority. The MDEQ maintains a robust public water supply regulatory program through long-standing partnerships with both the Region 5 Office of the United States Environmental Protection Agency (USEPA) and the state's regulated public water systems to achieve the shared goal of compliance with drinking water standards.

With respect to the draft memo referenced in your letter, the MDEQ never received copies of this draft memo from the USEPA Region 5, nor would we expect to while it is only a draft. The MDEQ became aware of the existence of this document because a reporter informed our Public Information Officer that it was available on the Web site of the American Civil Liberties Union. In subsequent discussions with the USEPA, our employees were told this draft memo was under further review by the USEPA's Region 5 managers. We were informed they would send copies when the document was final. We have yet to receive the final version.

Regulations associated with lead, copper and corrosion control (LCR) require communities to monitor water quality at customer taps. Compliance is determined by analyzing samples collected from targeted, high-risk residences that have been identified as having lead plumbing in the home, lead service connections, or copper piping with joints that used solder containing high concentrations of lead.

In an attempt to simulate worst case conditions, the LCR requires "first draw" samples be collected from designated taps after a period of no use that is representative of an overnight stagnation, typically six to eight hours. If more than ten percent of these compliance samples report lead above the federally established Action Level (AL) of 15 parts per billion (ppb), a water supply has an AL exceedance. An exceedance is not a violation. It triggers other requirements, including public notification, additional water quality sampling, and possibly further treatment.

The compliance monitoring for lead within the City has never exceeded this AL, either before or after the City switched sources and treatment methods. However, based on the population served by the Flint public water supply system, the City is required to not only comply with the lead AL of 15 ppb, but to also provide optimized corrosion control treatment.

When the LCR was first implemented, water systems had the opportunity to demonstrate they were already employing optimized corrosion control by sampling for lead concentrations using the monitoring requirements of this regulation. When Flint changed sources and modified

treatment from Lake Huron water treated conventionally by the Detroit Water and Sewerage Department, to the Flint River and lime softening treatment at the Flint Water Treatment Plant, the city was afforded the same opportunity of conducting lead monitoring during the first two 6-month monitoring periods to see if they were already providing optimal corrosion control.

The two monitoring periods during which lead samples were collected throughout Flint in accordance with these requirements were July through December 2014 and January through June 2015. As indicated above, neither round of lead compliance monitoring exceeded the AL. However, the results were unable to demonstrate that the City had optimized corrosion control treatment.

At that point, the MDEQ notified the City in correspondence dated August 17, 2015, that it must provide additional treatment to meet this optimized corrosion control requirement. Despite the LCR allowing a period of two years to evaluate, select and implement optimal corrosion control treatment, the City has committed to having this treatment in place by January 2016. The City also invited a USEPA representative from the Office of Research and Development to consult with the City's Technical Advisory Committee that will oversee the installation of additional corrosion control treatment at the water treatment plant.

Under the LCR, public water supplies like Flint are required to provide individual lead results to those customers whose homes are sampled for compliance with the AL. Each customer with an individual sample result that exceeds 15 parts per billion is also provided information on actions they can take to limit lead exposure in their drinking water. Furthermore, results from the most recent lead compliance monitoring determination are included each year in the annual consumer confidence report, also known as their annual water quality report that each community must provide to customers. As required by EPA, this report also includes general consumer awareness information regarding lead. You may access the latest report from Flint at: <https://www.cityofflint.com/wp-content/uploads/CCR-2014.pdf>. This report covers the results of water quality monitoring during May through December of 2014 when the city began using the Flint River.

Lead blood level monitoring is overseen by the Michigan Department of Health and Human Services (MDHHS). Their review of lead blood testing results for the 12 month period just after the City of Flint changed its water source (May 2014 – April 2015) showed no significant change in the pattern of lead blood levels in comparison with levels reported for the previous three years.

Additionally, analyses of water entering the distribution system after the water treatment plant continue to show no lead present. The lead being detected in water samples collected at peoples' homes is coming from service connection piping and household plumbing, the majority of which is the responsibility of the property owner. The Flint Water Department is responsible for providing high quality drinking water, but they cannot control the variety of materials used in plumbing components on private property. Even after the City initiates optimal corrosion control treatment, there will be circumstances where elevated lead may be present in customer taps as long as there are lead materials and lead components associated with service lines and home plumbing. Reducing public exposure to lead in drinking water cannot be achieved by public water supply regulation alone. The MDEQ has contacted the MDHHS in an attempt to develop an outreach campaign designed to inform civic leaders and City residents in Flint as well as other cities in Michigan about the primary sources of lead and actions they may take to minimize exposure.

As for the overall acceptability of the drinking water in Flint, the City currently has no unresolved violations of state and federal drinking water standards. The MDEQ continues to assist the City in providing a safe, reliable, and adequate supply for protecting public health, enhancing public safety, and as a pillar for economic development to advance the quality of life in this community.

If you should have additional questions, please contact Ms. Liane Shekter Smith, P.E., Chief, Office of Drinking Water and Municipal Assistance, at 517-284-6543; shekterl@michigan.gov; or MDEQ, P.O. Box 30241, Lansing, Michigan 48909-7741; or you may contact me.

Sincerely,

Dan Wyant  
Director  
517-284-6700

cc: State Senator Jim Ananich  
State Representative Sheldon Neeley  
State Representative Phil Phelps  
Mayor Dayne Walling, City of Flint  
Mr. Howard Croft, City of Flint  
Ms. Susan Hedman, USEPA  
Mr. Thomas Poy, USEPA  
Mr. Michael Schock, USEPA  
Mr. Darren Lytle, USEPA  
Ms. Denise Fortin, USEPA  
Mr. Marc Edwards, Virginia Tech  
Mr. Jim Sygo, Chief Deputy Director, MDEQ  
Ms. Madhu Anderson, Deputy Director, MDEQ  
Ms. Maggie Pallone, Deputy Director, MDEQ  
Mr. Brad Wurfel, Communications Director, MDEQ  
Ms. Liane Shekter Smith, MDEQ  
Mr. Richard Benzie, MDEQ  
Mr. Stephen Busch, MDEQ  
Mr. Pat Cook, MDEQ

3/11/2013

KWA Mtg

- Gen. Co.
- Steve A. + Jon B. - SR Dist DEQ
- Steve B. + Mike P. - Lin Dist DEQ
- John O'Leary
- Elgin Brown

Release PS 2-10 MGD Tanks @ Intermediate

Reservoir @ WTP

Any Flint 14 MGD  
GCD 16 MGD

IP Flint settles emergency com w/ Detroit  
Flint would

Tuesday waiting for bid opening

Lapeer AH from 72"

16" To "Lapeer WTP" or finished water GCD

KWA to Meter Pits & WTP's

2/26 Intake Bid Opening

12/20/14 5yr Completion

March / April 5 pipeline contracts

over \$2M would be high



- EM Negotiations

- Sunk Costs

1yr

Interim Agreement?

- New EM?

- Flint vs. GCDC/KWA

- River

→ Continuing

letter w/



② DWSD Financial Audit → the Bros get copy

Plant Operational

DWSD - Didn't meet the governor's deadline

Infrastructure Life

- Bolt Case

- Use of River

- Pb/Cu

- ASP capacity, Build timeline

KWQI

- Design Release LSP, WTP, Tans.

Mary Beth Thelma

- Krb by

- 1:00 - Security Desk

→ 3:00-4:30 ←

→ Mary

→ Called Luma

donaldsonk@midu

586-753-3759 Krb D. O'Neil

↳ WTP Allen Park

↳ Wayne Co

↳

PPI

753-3832

↳

Call on cell phone  
3:00



## **Frequently Asked Questions: Water Lead Levels in the City of Flint September 2015**

### **How can lead get into drinking water?**

Lead detections in Flint drinking water exist at the home level. Sampling at the Flint Water Treatment Plant has shown no lead in its treated water. However, this contaminant leaches into water from a home's lead service lines, lead solder, and leaded plumbing materials including fixtures, faucets, and fittings.

### **Does the city meet federal drinking water standards for lead and copper?**

Yes, the city is meeting state and federal guidelines for lead and copper.

The City of Flint has regularly monitored for lead and copper since federal law began requiring it in 1991.

When the City changed water sources in May 2014, state and federal law required the city to sample for lead and copper for a full year to determine how the water may be interacting with residential lead plumbing to increase lead levels. While the city's results show residential lead levels below the federal threshold for immediate response activities, Flint is moving quickly to optimize corrosion control measures in its water system.

### **Some individual homes showed high numbers for lead. Isn't that a concern?**

For the homeowner, yes it is. There is no "safe" level for lead, and while the leading cause of lead poisoning around the country is lead paint, any source of lead ingestion is worthy of concern.

But the State and federal guidelines for lead and copper acknowledge an important reality: Any home that has a lead service connection or lead plumbing will impart some varying amount of lead into the home's water. The only way to eliminate lead in a home water system is to remove lead plumbing or replace lead service connections to the city system.

The lead and copper rule requires the local operator to sample dozens, sometimes hundreds of homes in the service area to get a general sense of how the water supply is interacting with lead plumbing and service connections. The tests are done specifically at homes with lead service connections. Individual results vary and all participants are

### **Are there other ways the city monitors for lead exposure?**

The County Health Department, overseen statewide by the Michigan Department of Health and Human Services, regularly monitors blood levels in children throughout Michigan communities. The leading cause of lead poisoning is exposure to lead paint.

Blood lead level testing results for the 12-month period just after the City of Flint changed its water source (May 2014 – April 2015) showed no significant change in the pattern of blood lead levels in Flint, compared to the previous three years. This data suggests the recent change in water source by the City of Flint has not contributed to an increase in lead exposure throughout the community.

### **How does the state decide if the water is creating a lead problem?**

Compliance with the federal lead rule is based on a 90<sup>th</sup> percentile calculation. If more than 10 percent of samples report lead above the federal action level of **15 parts per billion**, a water supply has an "action level exceedance." An exceedance is not a violation. It triggers other requirements which could include public notification, additional water quality sampling, and possibly further treatment.

While some of Flint's individual samples exceeded the 15 parts-per-billion lead action level, compliance is based on **the 90<sup>th</sup> percentile of samples**. The City of Flint's 90<sup>th</sup> percentile level has ranged between 0 parts per billion in 2008 and 2011, and 15 parts per billion in 1992, but never exceeded the action level.

The two most recent sampling periods, in 2014 and 2015, were 6 parts per billion and 11 parts per billion, respectively.

### **Did the city use every sample they got back?**

Sampling requirements for lead and copper are designed to target the most common pathways to lead ingestion in homes with the least protection. The sample must be collected from a commonly used kitchen or bathroom tap, and in accordance with the provided sampling instructions. Homes that employ filtration or additional treatment cannot be included. Samples must also be collected within the established monitoring period.

### **I have a lead service connection or lead plumbing. What should I do?**

Replacement is the only way to eliminate lead exposure. However, here are some interim steps homeowners can take to reduce it:

Flush pipes before drinking, and only use cold water for consumption.

The more time water has been sitting in your home's pipes, the more lead it may contain. When water in a particular faucet has not been used for six hours or longer, "flush" cold-water pipes by running the water until it becomes as cold as it will get. This could take five to 30 seconds if there has been recent water use elsewhere in the home, such as showering or flushing toilets. Otherwise, it could take two minutes or longer.

Use only water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain higher levels of lead.

### **Who is responsible for replacement of lead materials?**

Replacement of service pipes on private property and any leaded plumbing materials within the home is a **homeowner's responsibility**. The City of Flint owns the service pipe from the water main to the curb stop valve, and that is **the City's responsibility**. This valve is normally located two feet in from the street curb. From there to the house is private property and the responsibility of the homeowner.

### **Why doesn't the city at least replace its portion of lead service lines?**

Partial lead service line replacement has been shown to mobilize more lead and make the situation worse. Only full lead service line replacement has been demonstrated effective in achieving long-term reductions in drinking water lead levels.

### **What is the City's timeline for installation of corrosion control treatment?**

The federal government allows the steps to complete the installation of optimal corrosion control treatment and follow-up monitoring to take up to five years.

However, the City of Flint has committed to completing installation of Optimized Corrosion Control Treatment in **less than six months**.

### **What will happen when Flint joins the Karegnondi Water Authority next year?**

The City has committed to having Optimized Corrosion Control Treatment in place prior to its connection with the Karegnondi Water Authority (KWA). The water provided by KWA will come from a new source, Lake Huron. The city will continue its lead and copper sampling every six months. Additionally, the city's water treatment plant will continue to operate with uninterrupted Optimized Corrosion Control Treatment.

### **How long would it take to replace lead service lines throughout Flint?**

The city has about 32,900 service connections in total. **More than 15,000** of these connections are considered lead service lines. Even if many crews were contracted, it would likely take up to 15 years to complete this work.

### **What would it cost to replace the lead service line at my house?**

Average costs to replace a lead service line at an individual home range from \$2,000 to \$8,000. Costs vary depending on the length and size of service line that is needed, as well as the ground cover and soil conditions encountered.

With more than 15,000 lead service lines at an estimated average cost of \$4,000 for each replacement, total cost could **be \$60 million or more**.

# DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract at Potter & Baxter

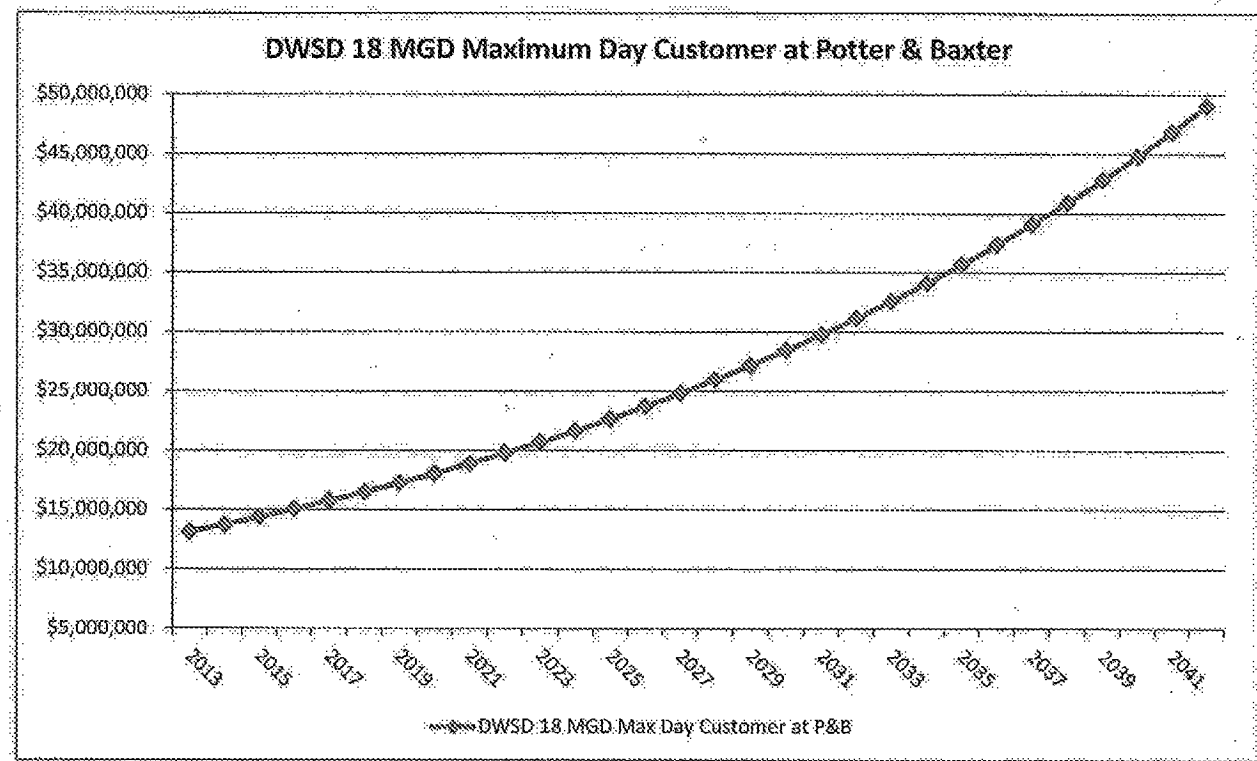
WTP Improvements?

As Backup

| Capacity                  | Flint ADD:           | 0.60 MGD    | 81 MCF/Day             | 1  | 2013 | Flint WTP O&M  | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------------------------|----------------------|-------------|------------------------|----|------|----------------|----------------|----------------------|---------------------|---------------|
|                           | DWSD ADD:            | 12 MGD      | 1,604 MCF/Day          | 2  | 2014 | \$ 3,538,214   | 9,585,642      | -                    | -                   | \$ 13,123,856 |
|                           |                      |             |                        | 3  | 2015 | \$ 3,697,788   | 10,036,167     | -                    | -                   | \$ 13,733,955 |
|                           |                      |             |                        | 4  | 2016 | \$ 3,864,558   | 10,507,867     | -                    | -                   | \$ 14,372,425 |
| Annual Volume             | Flint:               | 29,412 MCF  |                        | 5  | 2017 | \$ 4,038,850   | 11,001,736     | -                    | -                   | \$ 15,040,586 |
|                           | DWSD:                | 585,561 MCF |                        | 6  | 2018 | \$ 4,221,002   | 11,518,818     | -                    | -                   | \$ 15,739,820 |
|                           |                      |             |                        | 7  | 2019 | \$ 4,411,369   | 12,060,203     | -                    | -                   | \$ 16,471,571 |
|                           |                      |             |                        | 8  | 2020 | \$ 4,610,322   | 12,627,032     | -                    | -                   | \$ 17,237,354 |
| 2013 Cost of Supply       |                      |             |                        | 9  | 2021 | \$ 4,818,247   | 13,220,503     | -                    | -                   | \$ 18,038,750 |
|                           | Flint WTP O&M:       | 120.30 /MCF | \$ 3,538,214 /Yr       | 10 | 2022 | \$ 5,035,550   | 13,841,866     | -                    | -                   | \$ 18,877,416 |
|                           | DWSD:                | 16.37 /MCF  | \$ 9,585,642 /Yr       | 11 | 2023 | \$ 5,262,653   | 14,492,434     | -                    | -                   | \$ 19,755,087 |
|                           |                      |             |                        | 12 | 2024 | \$ 5,499,989   | 15,173,578     | -                    | -                   | \$ 20,673,567 |
| Escalation/Inflation Rate |                      |             |                        | 13 | 2025 | \$ 5,748,049   | 15,886,736     | -                    | -                   | \$ 21,634,785 |
|                           | Flint:               | 4.51% /Yr   |                        | 14 | 2026 | \$ 6,007,286   | 16,633,413     | -                    | -                   | \$ 22,640,699 |
|                           | DWSD:                | 4.7% /Yr    |                        | 15 | 2027 | \$ 6,278,215   | 17,415,183     | -                    | -                   | \$ 23,693,398 |
|                           |                      |             |                        | 16 | 2028 | \$ 6,561,362   | 18,233,697     | -                    | -                   | \$ 24,795,059 |
|                           |                      |             |                        | 17 | 2029 | \$ 6,857,279   | 19,090,681     | -                    | -                   | \$ 25,947,960 |
| Capital Expenditure       |                      |             |                        | 18 | 2030 | \$ 7,166,543   | 19,987,943     | -                    | -                   | \$ 27,154,486 |
|                           | Amount:              | \$ -        |                        | 19 | 2031 | \$ 7,489,754   | 20,927,376     | -                    | -                   | \$ 28,417,130 |
|                           | Reserve:             | \$ -        | 0% Reserve Rate: 0.00% | 20 | 2032 | \$ 7,827,542   | 21,910,963     | -                    | -                   | \$ 29,738,505 |
|                           | Amount plus Reserve: | \$ -        |                        | 21 | 2033 | \$ 8,180,564   | 22,940,778     | -                    | -                   | \$ 31,121,342 |
|                           | Revenue Bond Rate:   | 5%          |                        | 22 | 2034 | \$ 8,549,507   | 24,018,995     | -                    | -                   | \$ 32,568,502 |
|                           | Number of Years:     | 25          |                        | 23 | 2035 | \$ 8,935,090   | 25,147,887     | -                    | -                   | \$ 34,082,977 |
|                           | Annual Cost:         | \$0         |                        | 24 | 2036 | \$ 9,338,063   | 26,329,839     | -                    | -                   | \$ 35,667,901 |
|                           |                      |             |                        | 25 | 2037 | \$ 9,759,209   | 27,567,341     | -                    | -                   | \$ 37,326,550 |
|                           |                      |             |                        |    | 2038 | \$ 10,199,350  | 28,863,006     | -                    | -                   | \$ 39,062,355 |
|                           |                      |             |                        |    | 2039 | \$ 10,659,340  | 30,219,567     | -                    | -                   | \$ 40,878,907 |
|                           |                      |             |                        |    | 2040 | \$ 11,140,076  | 31,639,886     | -                    | -                   | \$ 42,779,963 |
|                           |                      |             |                        |    | 2041 | \$ 11,642,494  | 33,126,961     | -                    | -                   | \$ 44,769,455 |
|                           |                      |             |                        |    | 2042 | \$ 12,167,570  | 34,683,928     | -                    | -                   | \$ 46,851,499 |
|                           |                      |             |                        |    |      | \$ 12,716,328  | 36,314,073     | -                    | -                   | \$ 49,030,401 |
|                           |                      |             |                        |    |      | \$ 216,222,171 |                |                      |                     |               |

25 Yrs Cumulative  
\$ 596,916,044

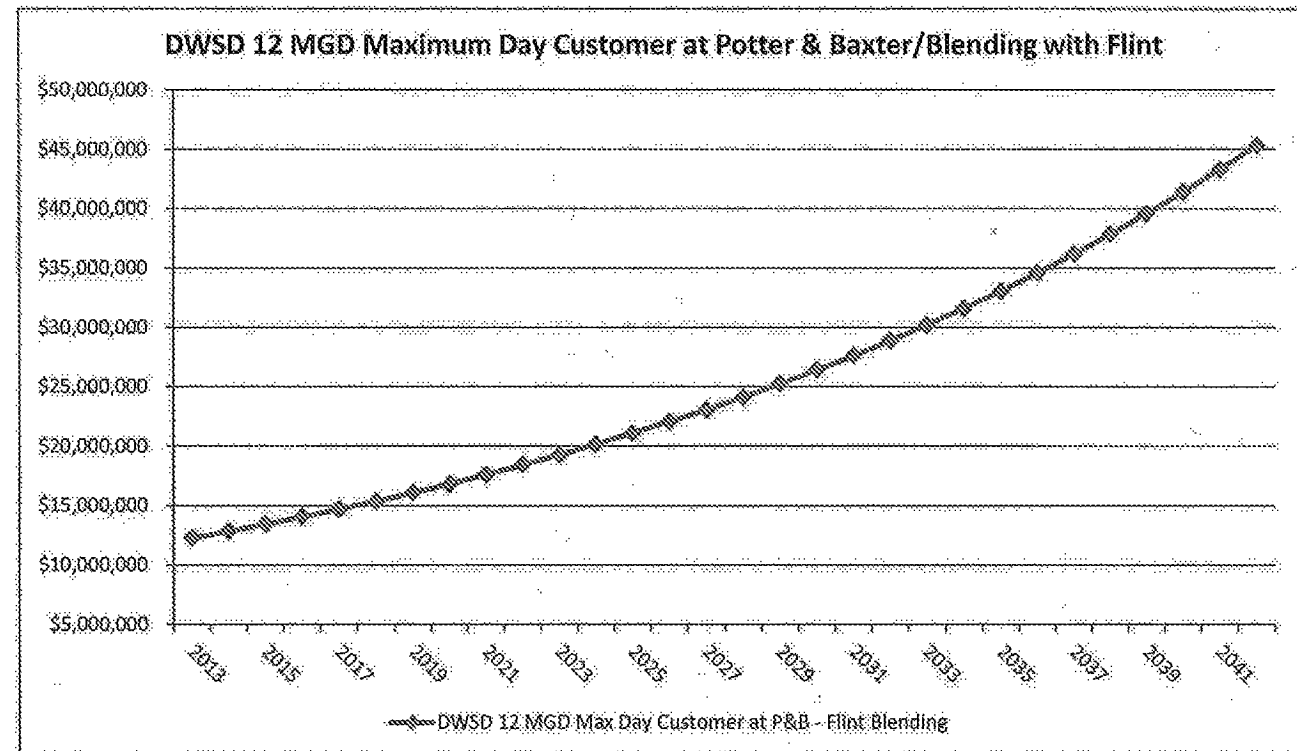
30 Yrs Cumulative  
\$ 821,226,268



# DWSD Worksheet : 12 MGD Maximum Day Customer with Model Contract at Potter & Baxter/Blending with Flint

WTP Improvements

| Capacity                  | Flint ADD:           | 4 MGD         | 535 MCF/Day            | 1  | 2013 | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------------------------|----------------------|---------------|------------------------|----|------|---------------|----------------|----------------------|---------------------|---------------|
|                           | DWSD ADD:            | 8 MGD         | 1,070 MCF/Day          | 2  | 2014 | \$ 5,895,097  | 6,367,005      | -                    | -                   | \$ 12,262,103 |
|                           |                      |               |                        | 3  | 2015 | \$ 6,160,966  | 6,666,255      | -                    | -                   | \$ 12,827,221 |
|                           |                      |               |                        | 4  | 2016 | \$ 6,438,826  | 6,979,569      | -                    | -                   | \$ 13,418,395 |
| Annual Volume             | Flint:               | 195,187 MCF   | 195,187.1658           | 5  | 2017 | \$ 6,729,217  | 7,307,608      | -                    | -                   | \$ 14,036,825 |
|                           | DWSD:                | 390,374 MCF   | 589,509.471            | 6  | 2018 | \$ 7,032,705  | 7,651,066      | -                    | -                   | \$ 14,683,771 |
| 2013 Cost of Supply       |                      |               |                        | 7  | 2019 | \$ 7,349,880  | 8,010,666      | -                    | -                   | \$ 15,360,546 |
|                           |                      |               |                        | 8  | 2020 | \$ 7,681,359  | 8,387,167      | -                    | -                   | \$ 16,068,527 |
|                           | Flint WTP O&M:       | \$ 30.20 /MCF | \$ 5,895,097 /Yr       | 9  | 2021 | \$ 8,027,789  | 8,781,364      | -                    | -                   | \$ 16,809,153 |
|                           | DWSD:                | \$ 16.31 /MCF | \$ 6,367,005 /Yr       | 10 | 2022 | \$ 8,389,842  | 9,194,088      | -                    | -                   | \$ 17,583,930 |
| Escalation/Inflation Rate |                      |               |                        | 11 | 2023 | \$ 8,768,224  | 9,626,210      | -                    | -                   | \$ 18,394,434 |
|                           | Flint:               | 4.51% /Yr     |                        | 12 | 2024 | \$ 9,163,671  | 10,078,642     | -                    | -                   | \$ 19,242,313 |
|                           | DWSD:                | 4.7% /Yr      |                        | 13 | 2025 | \$ 9,576,952  | 10,552,338     | -                    | -                   | \$ 20,129,291 |
| Capital Expenditure       |                      |               |                        | 14 | 2026 | \$ 10,008,873 | 11,048,298     | -                    | -                   | \$ 21,057,171 |
|                           | Amount:              | \$ -          |                        | 15 | 2027 | \$ 10,460,273 | 11,567,568     | -                    | -                   | \$ 22,027,841 |
|                           | Reserve:             | \$ -          | 0% Reserve Rate: 0.00% | 16 | 2028 | \$ 10,932,031 | 12,111,244     | -                    | -                   | \$ 23,043,275 |
|                           | Amount plus Reserve: | \$ -          |                        | 17 | 2029 | \$ 11,425,066 | 12,680,473     | -                    | -                   | \$ 24,105,538 |
|                           | Revenue Bond Rate:   | 5%            |                        | 18 | 2030 | \$ 11,940,336 | 13,276,455     | -                    | -                   | \$ 25,216,791 |
|                           | Number of Years:     | 25            |                        | 19 | 2031 | \$ 12,478,845 | 13,900,448     | -                    | -                   | \$ 26,379,294 |
|                           | Annual Cost:         | \$0           |                        | 20 | 2032 | \$ 13,041,641 | 14,553,769     | -                    | -                   | \$ 27,595,410 |
|                           |                      |               |                        | 21 | 2033 | \$ 13,629,819 | 15,237,796     | -                    | -                   | \$ 28,867,616 |
|                           |                      |               |                        | 22 | 2034 | \$ 14,244,524 | 15,953,973     | -                    | -                   | \$ 30,198,497 |
|                           |                      |               |                        | 23 | 2035 | \$ 14,886,952 | 16,703,810     | -                    | -                   | \$ 31,590,762 |
|                           |                      |               |                        | 24 | 2036 | \$ 15,558,354 | 17,488,888     | -                    | -                   | \$ 33,047,242 |
|                           |                      |               |                        | 25 | 2037 | \$ 16,260,035 | 18,310,866     | -                    | -                   | \$ 34,570,902 |
|                           |                      |               |                        |    | 2038 | \$ 16,993,363 | 19,171,477     | -                    | -                   | \$ 36,164,840 |
|                           |                      |               |                        |    | 2039 | \$ 17,759,764 | 20,072,537     | -                    | -                   | \$ 37,832,300 |
|                           |                      |               |                        |    | 2040 | \$ 18,560,729 | 21,015,946     | -                    | -                   | \$ 39,576,675 |
|                           |                      |               |                        |    | 2041 | \$ 19,397,818 | 22,003,695     | -                    | -                   | \$ 41,401,513 |
|                           |                      |               |                        |    | 2042 | \$ 20,272,660 | 23,037,869     | -                    | -                   | \$ 43,310,528 |
|                           |                      |               |                        |    |      | \$ 21,186,956 | 24,120,649     | -                    | -                   | \$ 45,307,605 |



25 Yrs Cumulative  
\$ 554,681,686

30 Yrs Cumulative  
\$ 762,110,308

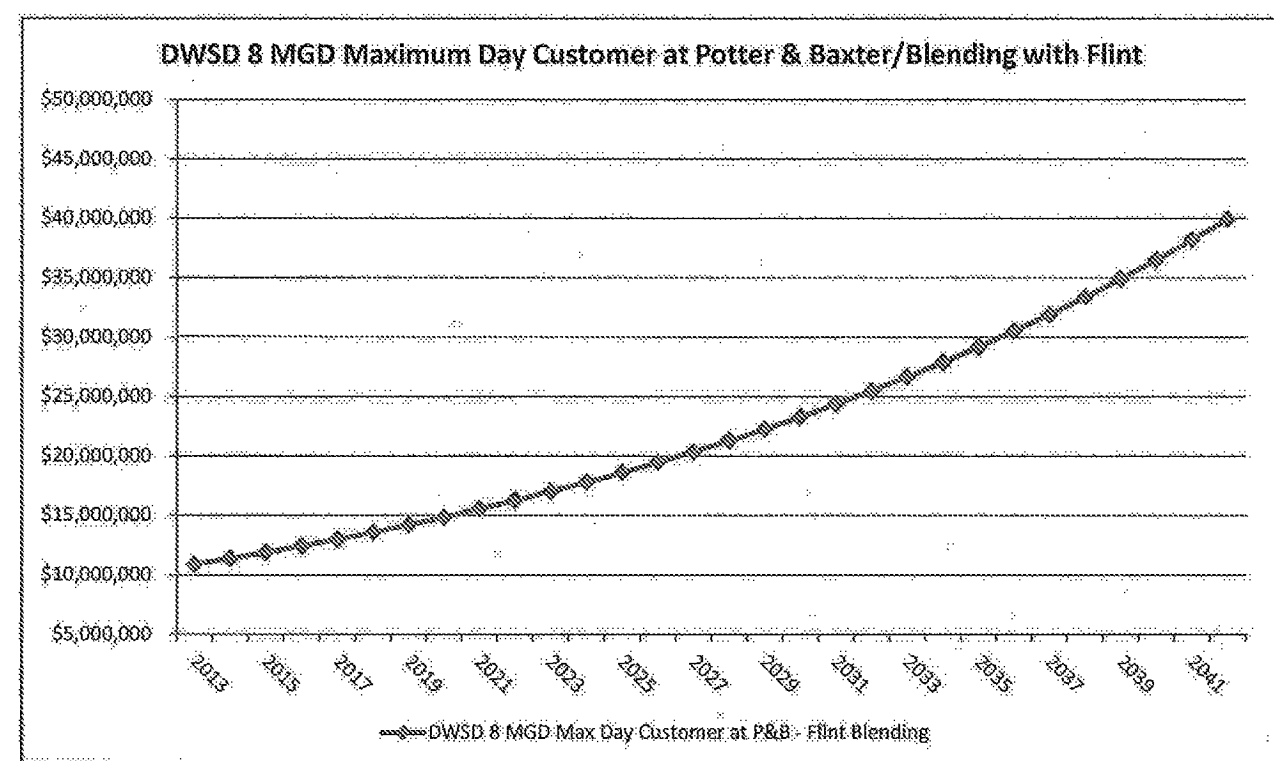
Same as 12 MGD Plan

DWSD Worksheet : 8 MGD Maximum Day Customer with Model Contract at Potter & Baxter/Blending with Flint

| Capacity                  | Flint ADD:           | 4 MGD         | 535 MCF/Day            | 1  | 2013 | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------------------------|----------------------|---------------|------------------------|----|------|---------------|----------------|----------------------|---------------------|---------------|
|                           | DWSD ADD:            | 8 MGD         | 1,070 MCF/Day          | 2  | 2014 | \$ 5,895,097  | 4,949,947      | -                    | -                   | \$ 10,845,044 |
|                           |                      |               |                        | 3  | 2015 | \$ 6,160,966  | 5,182,594      | -                    | -                   | \$ 11,343,560 |
|                           |                      |               |                        | 4  | 2016 | \$ 6,438,826  | 5,426,176      | -                    | -                   | \$ 11,865,002 |
| Annual Volume             | Flint:               | 195,187 MCF   |                        | 5  | 2017 | \$ 6,729,217  | 5,681,206      | -                    | -                   | \$ 12,410,423 |
|                           | DWSD:                | 390,374 MCF   |                        | 6  | 2018 | \$ 7,032,705  | 5,948,223      | -                    | -                   | \$ 12,980,928 |
|                           |                      |               |                        | 7  | 2019 | \$ 7,349,880  | 6,227,789      | -                    | -                   | \$ 13,577,669 |
| 2013 Cost of Supply       |                      |               |                        | 8  | 2020 | \$ 7,681,359  | 6,520,495      | -                    | -                   | \$ 14,201,855 |
|                           | Flint WTP O&M:       | \$ 30.20 /MCF | \$ 5,895,097 /Yr       | 9  | 2021 | \$ 8,027,789  | 6,826,959      | -                    | -                   | \$ 14,854,747 |
|                           | DWSD:                | \$ 12.68 /MCF | \$ 4,949,947 /Yr       | 10 | 2022 | \$ 8,389,842  | 7,147,826      | -                    | -                   | \$ 15,537,668 |
|                           |                      |               |                        | 11 | 2023 | \$ 8,768,224  | 7,483,774      | -                    | -                   | \$ 16,251,997 |
| Escalation/inflation Rate |                      |               |                        | 12 | 2024 | \$ 9,163,671  | 7,835,511      | -                    | -                   | \$ 16,999,182 |
|                           | Flint:               | 4.51% /Yr     |                        | 13 | 2025 | \$ 9,576,952  | 8,203,780      | -                    | -                   | \$ 17,780,732 |
|                           | DWSD:                | 4.7% /Yr      |                        | 14 | 2026 | \$ 10,008,873 | 8,589,358      | -                    | -                   | \$ 18,598,230 |
|                           |                      |               |                        | 15 | 2027 | \$ 10,460,273 | 8,993,057      | -                    | -                   | \$ 19,453,330 |
| Capital Expenditure       |                      |               |                        | 16 | 2028 | \$ 10,932,031 | 9,415,731      | -                    | -                   | \$ 20,347,762 |
|                           | Amount:              | \$ -          |                        | 17 | 2029 | \$ 11,425,066 | 9,858,271      | -                    | -                   | \$ 21,283,336 |
|                           | Reserve:             | \$ -          | 0% Reserve Rate: 0.00% | 18 | 2030 | \$ 11,940,336 | 10,321,609     | -                    | -                   | \$ 22,261,945 |
|                           | Amount plus Reserve: | \$ -          |                        | 19 | 2031 | \$ 12,478,845 | 10,806,725     | -                    | -                   | \$ 23,285,570 |
|                           | Revenue Bond Rate:   | 5%            |                        | 20 | 2032 | \$ 13,041,641 | 11,314,641     | -                    | -                   | \$ 24,356,282 |
|                           | Number of Years:     | 25            |                        | 21 | 2033 | \$ 13,629,819 | 11,846,429     | -                    | -                   | \$ 25,476,248 |
|                           | Annual Cost:         | \$0           |                        | 22 | 2034 | \$ 14,244,524 | 12,403,211     | -                    | -                   | \$ 26,647,735 |
|                           |                      |               |                        | 23 | 2035 | \$ 14,886,952 | 12,986,162     | -                    | -                   | \$ 27,873,114 |
|                           |                      |               |                        | 24 | 2036 | \$ 15,558,354 | 13,596,512     | -                    | -                   | \$ 29,154,866 |
|                           |                      |               |                        | 25 | 2037 | \$ 16,260,035 | 14,235,548     | -                    | -                   | \$ 30,495,583 |
|                           |                      |               |                        |    | 2038 | \$ 16,993,363 | 14,904,619     | -                    | -                   | \$ 31,897,982 |
|                           |                      |               |                        |    | 2039 | \$ 17,759,764 | 15,605,136     | -                    | -                   | \$ 33,364,899 |
|                           |                      |               |                        |    | 2040 | \$ 18,560,729 | 16,338,577     | -                    | -                   | \$ 34,899,306 |
|                           |                      |               |                        |    | 2041 | \$ 19,397,818 | 17,106,490     | -                    | -                   | \$ 36,504,308 |
|                           |                      |               |                        |    | 2042 | \$ 20,272,660 | 17,910,495     | -                    | -                   | \$ 38,183,155 |
|                           |                      |               |                        |    |      | \$ 21,186,956 | 18,752,288     | -                    | -                   | \$ 39,939,245 |

25 Yrs Cumulative  
\$ 489,780,792

30 Yrs Cumulative  
\$ 672,671,705





# DWSD Worksheet : 12 MGD Maximum Day Customer with Model Contract at Imlay/Blending with Flint

No WTP Improvements

## Capacity

Flint ADD: 4 MGD 535 MCF/Day  
DWSD ADD: 8 MGD 1,070 MCF/Day

## Annual Volume

Flint: 195,187 MCF  
DWSD: 390,374 MCF

## 2013 Cost of Supply

Flint WTP O&M: \$ 30.20 /MCF \$ 5,895,097 /Yr  
DWSD: \$ 14.38 /MCF \$ 5,613,583 /Yr

## Escalation/Inflation Rate

Flint: 4.51% /Yr  
DWSD: 4.7% /Yr

## Capital Expenditure

Capital: \$ 4,700,000  
Bond Issuance (3% of Total): 195,000 Check: 3.0%  
3 Years of Capitalized Interest: 975,000 Check: 5.0% /Yr (Bond Interest on Total)  
Reserve (10% of Total): 650,000 Check: 10.0%  
Total: \$ 6,520,000

Revenue Bond Rate: 5%  
Number of Years: 25  
Annual Cost: \$462,610  
Interest on Reserve: 3%

| Year | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|------|---------------|----------------|----------------------|---------------------|---------------|
| 2013 | \$ 5,895,097  | 5,613,583      |                      | 19,500              | \$ 11,489,180 |
| 2014 | \$ 6,160,966  | 5,877,421      |                      | 19,500              | \$ 12,018,888 |
| 2015 | \$ 6,438,826  | 6,153,660      |                      | 19,500              | \$ 12,572,986 |
| 2016 | \$ 6,729,217  | 6,442,882      | 462,610              | 19,500              | \$ 13,615,209 |
| 2017 | \$ 7,032,705  | 6,745,698      | 462,610              | 19,500              | \$ 14,221,512 |
| 2018 | \$ 7,349,880  | 7,062,745      | 462,610              | 19,500              | \$ 14,855,735 |
| 2019 | \$ 7,681,359  | 7,394,694      | 462,610              | 19,500              | \$ 15,519,164 |
| 2020 | \$ 8,027,789  | 7,742,245      | 462,610              | 19,500              | \$ 16,213,144 |
| 2021 | \$ 8,389,842  | 8,106,131      | 462,610              | 19,500              | \$ 16,939,082 |
| 2022 | \$ 8,768,224  | 8,487,119      | 462,610              | 19,500              | \$ 17,698,452 |
| 2023 | \$ 9,163,671  | 8,886,013      | 462,610              | 19,500              | \$ 18,492,794 |
| 2024 | \$ 9,576,952  | 9,303,656      | 462,610              | 19,500              | \$ 19,323,718 |
| 2025 | \$ 10,008,873 | 9,740,928      | 462,610              | 19,500              | \$ 20,192,910 |
| 2026 | \$ 10,460,273 | 10,198,751     | 462,610              | 19,500              | \$ 21,102,134 |
| 2027 | \$ 10,932,031 | 10,678,093     | 462,610              | 19,500              | \$ 22,053,234 |
| 2028 | \$ 11,425,066 | 11,179,963     | 462,610              | 19,500              | \$ 23,048,139 |
| 2029 | \$ 11,940,336 | 11,705,421     | 462,610              | 19,500              | \$ 24,088,867 |
| 2030 | \$ 12,478,845 | 12,255,576     | 462,610              | 19,500              | \$ 25,177,531 |
| 2031 | \$ 13,041,641 | 12,831,588     | 462,610              | 19,500              | \$ 26,316,339 |
| 2032 | \$ 13,629,819 | 13,434,673     | 462,610              | 19,500              | \$ 27,507,602 |
| 2033 | \$ 14,244,524 | 14,066,102     | 462,610              | 19,500              | \$ 28,753,736 |
| 2034 | \$ 14,886,952 | 14,727,209     | 462,610              | 19,500              | \$ 30,057,271 |
| 2035 | \$ 15,558,354 | 15,419,388     | 462,610              | 19,500              | \$ 31,420,852 |
| 2036 | \$ 16,260,035 | 16,144,099     | 462,610              | 19,500              | \$ 32,847,245 |
| 2037 | \$ 16,993,363 | 16,902,872     | 462,610              | 19,500              | \$ 34,339,345 |
| 2038 | \$ 17,759,764 | 17,697,307     | 462,610              | 19,500              | \$ 35,900,181 |
| 2039 | \$ 18,560,729 | 18,529,080     | 462,610              | 19,500              | \$ 37,532,919 |
| 2040 | \$ 19,397,818 | 19,399,947     | 462,610              | 19,500              | \$ 39,240,875 |
| 2041 | \$ 20,272,660 | 20,311,745     |                      |                     | \$ 40,584,404 |
| 2042 | \$ 21,186,956 | 21,266,397     |                      |                     | \$ 42,453,353 |

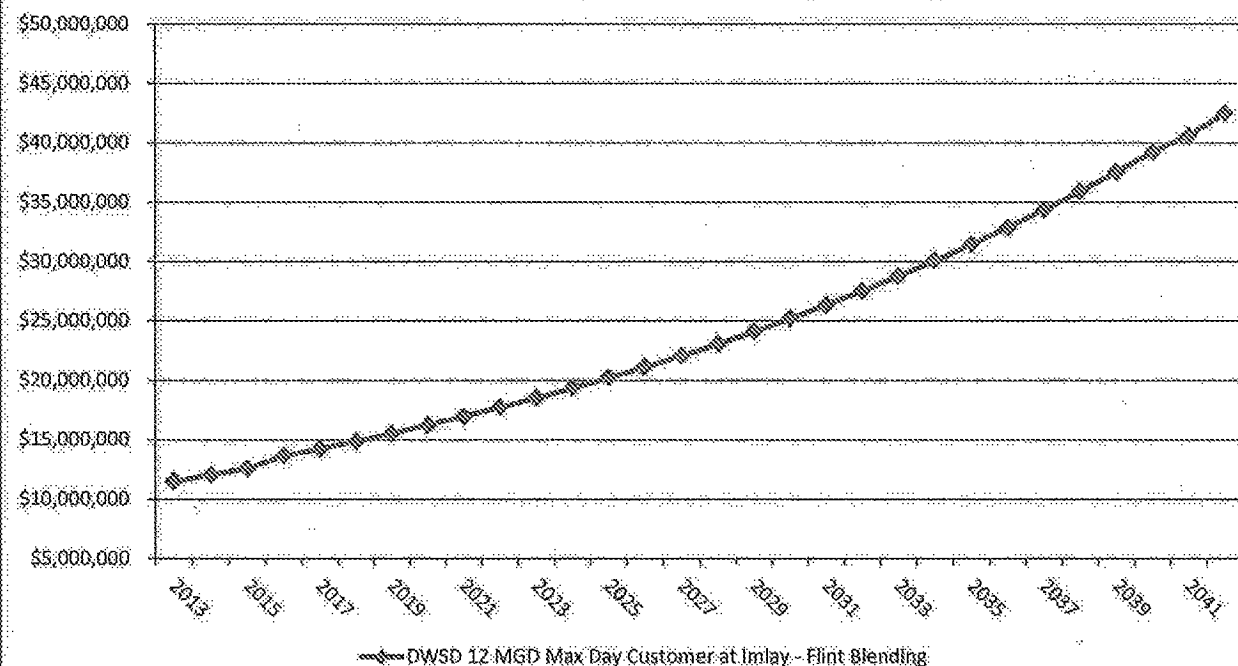
## 25 Yrs Cumulative

\$ 529,865,071

## 30 Yrs Cumulative

\$ 725,576,803

DWSD 12 MGD Maximum Day Customer at Imlay/Blending with Flint



# DWSD Worksheet : 8 MGD Maximum Day Customer with Model Contract at Imlay/Blending with Flint

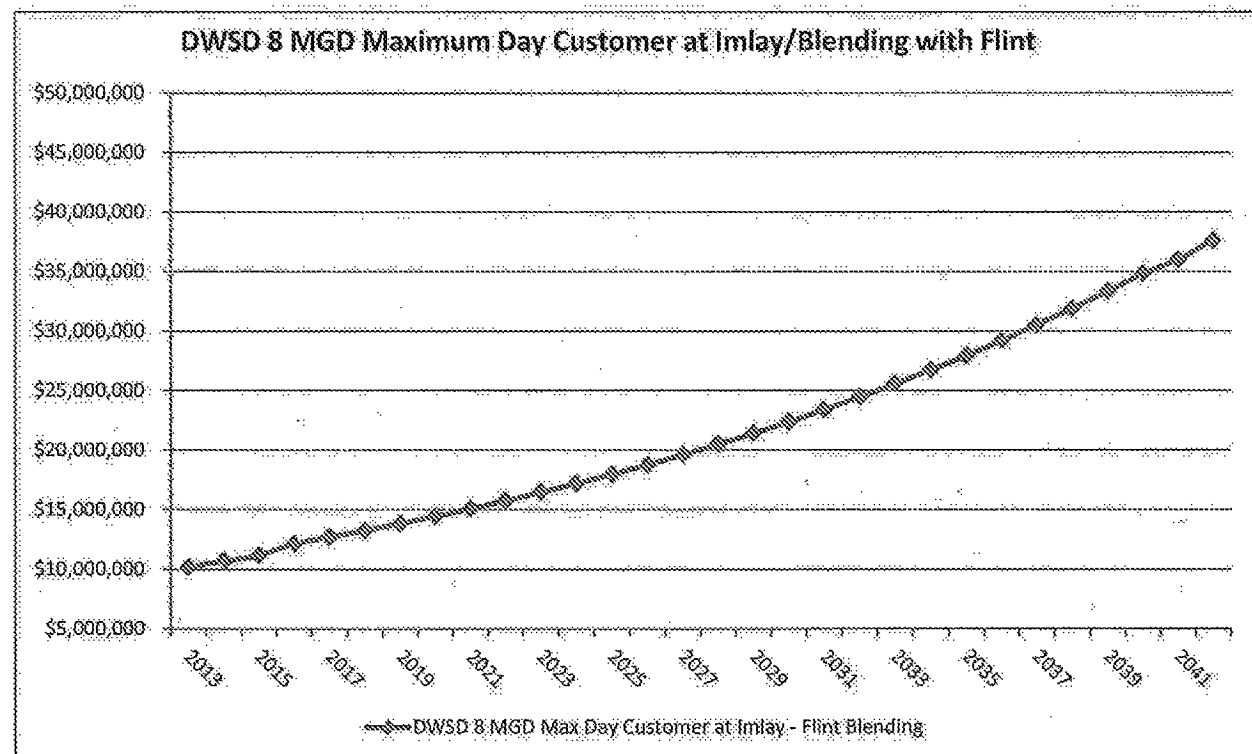
See as 12

WTP Expense

| Capacity                  | Flint ADD:                       | 4            | MGD    | 535                               | MCF/Day | 1  | Year | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------------------------|----------------------------------|--------------|--------|-----------------------------------|---------|----|------|---------------|----------------|----------------------|---------------------|---------------|
|                           | DWSD ADD:                        | 8            | MGD    | 1,070                             | MCF/Day | 2  | 2013 | \$ 5,895,097  | 4,337,059      |                      | 19,500              | \$ 10,212,656 |
|                           |                                  |              |        |                                   |         | 3  | 2014 | \$ 6,160,966  | 4,540,901      |                      | 19,500              | \$ 10,682,367 |
|                           |                                  |              |        |                                   |         | 4  | 2015 | \$ 6,438,826  | 4,754,323      |                      | 19,500              | \$ 11,173,649 |
| Annual Volume             |                                  |              |        |                                   |         | 5  | 2016 | \$ 6,729,217  | 4,977,776      | 462,610              | 19,500              | \$ 12,150,103 |
|                           | Flint:                           | 195,187      | MCF    |                                   |         | 6  | 2017 | \$ 7,032,705  | 5,211,732      | 462,610              | 19,500              | \$ 12,687,546 |
|                           | DWSD:                            | 390,374      | MCF    |                                   |         | 7  | 2018 | \$ 7,349,880  | 5,456,683      | 462,610              | 19,500              | \$ 13,249,673 |
| 2013 Cost of Supply       |                                  |              |        |                                   |         | 8  | 2019 | \$ 7,681,359  | 5,713,147      | 462,610              | 19,500              | \$ 13,837,616 |
|                           | Flint WTP O&M:                   | \$ 30.20     | /MCF   | \$ 5,895,097                      | /Yr     | 9  | 2020 | \$ 8,027,789  | 5,981,665      | 462,610              | 19,500              | \$ 14,452,564 |
|                           | DWSD:                            | \$ 11.11     | /MCF   | \$ 4,337,059                      | /Yr     | 10 | 2021 | \$ 8,389,842  | 6,262,803      | 462,610              | 19,500              | \$ 15,095,755 |
| Escalation/Inflation Rate |                                  |              |        |                                   |         | 11 | 2022 | \$ 8,768,224  | 6,557,155      | 462,610              | 19,500              | \$ 15,768,489 |
|                           | Flint:                           | 4.51%        | /Yr    |                                   |         | 12 | 2023 | \$ 9,163,671  | 6,865,341      | 462,610              | 19,500              | \$ 16,472,122 |
|                           | DWSD:                            | 4.7%         | /Yr    |                                   |         | 13 | 2024 | \$ 9,576,952  | 7,188,012      | 462,610              | 19,500              | \$ 17,208,074 |
| Capital Expenditure       |                                  |              |        |                                   |         | 14 | 2025 | \$ 10,008,873 | 7,525,849      | 462,610              | 19,500              | \$ 17,977,832 |
|                           | Capital:                         | \$ 4,700,000 |        |                                   |         | 15 | 2026 | \$ 10,460,273 | 7,879,564      | 462,610              | 19,500              | \$ 18,782,947 |
|                           | Bond Issuance (3% of Total):     | 195,000      | Check: | 3.0%                              |         | 16 | 2027 | \$ 10,932,031 | 8,249,903      | 462,610              | 19,500              | \$ 19,625,044 |
|                           | 3 Years of Capitalized Interest: | 975,000      | Check: | 5.0% /Yr (Bond Interest on Total) |         | 17 | 2028 | \$ 11,425,066 | 8,637,649      | 462,610              | 19,500              | \$ 20,505,824 |
|                           | Reserve (10% of Total):          | 650,000      | Check: | 10.0%                             |         | 18 | 2029 | \$ 11,940,336 | 9,043,618      | 462,610              | 19,500              | \$ 21,427,064 |
|                           | Total:                           | \$ 6,520,000 |        |                                   |         | 19 | 2030 | \$ 12,478,845 | 9,468,668      | 462,610              | 19,500              | \$ 22,390,624 |
| Revenue Bond Rate:        | 5%                               |              |        |                                   |         | 20 | 2031 | \$ 13,041,641 | 9,913,696      | 462,610              | 19,500              | \$ 23,398,447 |
| Number of Years:          | 25                               |              |        |                                   |         | 21 | 2032 | \$ 13,629,819 | 10,379,639     | 462,610              | 19,500              | \$ 24,452,569 |
| Annual Cost:              | \$462,610                        |              |        |                                   |         | 22 | 2033 | \$ 14,244,524 | 10,867,482     | 462,610              | 19,500              | \$ 25,555,117 |
| Interest on Reserve:      | 3%                               |              |        |                                   |         | 23 | 2034 | \$ 14,886,952 | 11,378,254     | 462,610              | 19,500              | \$ 26,708,316 |
|                           |                                  |              |        |                                   |         | 24 | 2035 | \$ 15,558,354 | 11,913,032     | 462,610              | 19,500              | \$ 27,914,496 |
|                           |                                  |              |        |                                   |         | 25 | 2036 | \$ 16,260,035 | 12,472,945     | 462,610              | 19,500              | \$ 29,176,090 |
|                           |                                  |              |        |                                   |         |    | 2037 | \$ 16,993,363 | 13,059,173     | 462,610              | 19,500              | \$ 30,495,646 |
|                           |                                  |              |        |                                   |         |    | 2038 | \$ 17,759,764 | 13,672,954     | 462,610              | 19,500              | \$ 31,875,828 |
|                           |                                  |              |        |                                   |         |    | 2039 | \$ 18,560,729 | 14,315,583     | 462,610              | 19,500              | \$ 33,319,422 |
|                           |                                  |              |        |                                   |         |    | 2040 | \$ 19,397,818 | 14,988,415     | 462,610              | 19,500              | \$ 34,829,343 |
|                           |                                  |              |        |                                   |         |    | 2041 | \$ 20,272,660 | 15,692,871     |                      |                     | \$ 35,965,530 |
|                           |                                  |              |        |                                   |         |    | 2042 | \$ 21,186,956 | 16,430,436     |                      |                     | \$ 37,617,392 |

DWSD  
line  
Purchase

|                      |           |
|----------------------|-----------|
| Revenue Bond Rate:   | 5%        |
| Number of Years:     | 25        |
| Annual Cost:         | \$462,610 |
| Interest on Reserve: | 3%        |



25 Yrs Cumulative  
\$ 493,063,801

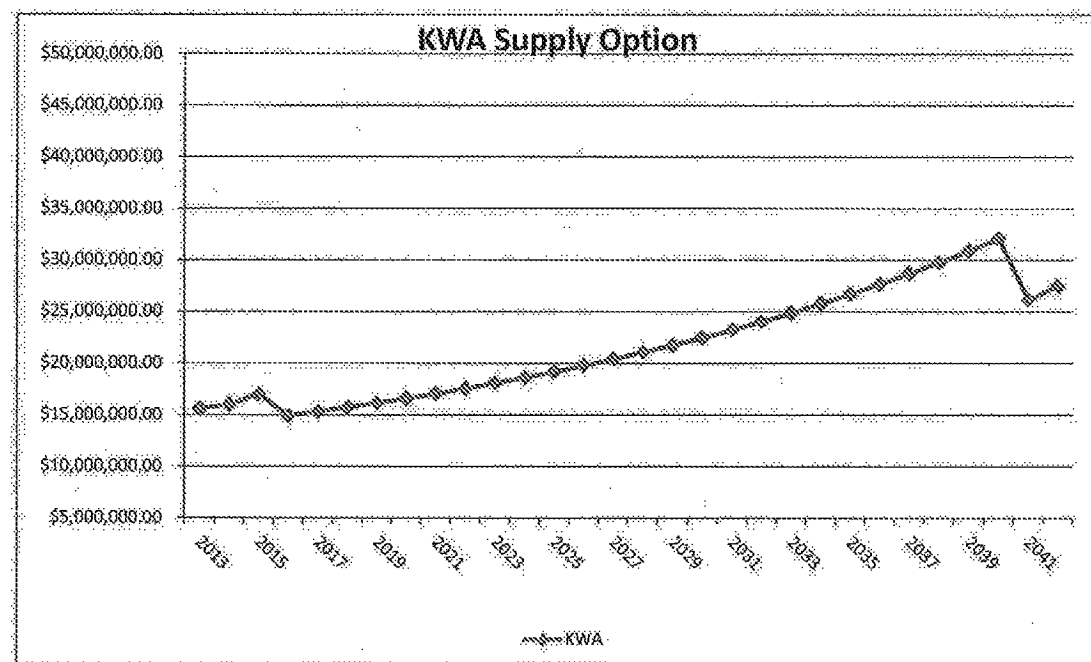
30 Yrs Cumulative  
\$ 634,795,488

KWA Supply Option Worksheet  
KWA 10/31/12 No Overruns

|    | Year | DWSD & Flint<br>WTP Costs | KWA Entry<br>Fee | KWA Debt<br>service | Flint WTP<br>Debt Service | KWA<br>Operation<br>s | Flint WTP<br>Operations<br>with KWA | TOTAL         |
|----|------|---------------------------|------------------|---------------------|---------------------------|-----------------------|-------------------------------------|---------------|
| 1  | 2013 | \$ 14,413,858             | 1,162,800        |                     |                           |                       |                                     | \$ 15,576,658 |
| 2  | 2014 | \$ 15,355,135             | 581,400          |                     |                           |                       |                                     | \$ 15,936,535 |
| 3  | 2015 | \$ 16,365,534             | 581,400          |                     |                           |                       |                                     | \$ 16,946,934 |
| 4  | 2016 |                           |                  | 6,593,155           | 572,781                   | 878,869               | 6,843,344                           | \$ 14,888,149 |
| 5  | 2017 |                           |                  | 6,593,155           | 572,781                   | 922,812               | 7,185,511                           | \$ 15,274,260 |
| 6  | 2018 |                           |                  | 6,593,155           | 572,781                   | 968,953               | 7,544,787                           | \$ 15,679,676 |
| 7  | 2019 |                           |                  | 6,593,155           | 572,781                   | 1,017,401             | 7,922,926                           | \$ 16,105,363 |
| 8  | 2020 |                           |                  | 6,593,155           | 572,781                   | 1,068,271             | 8,318,127                           | \$ 16,552,334 |
| 9  | 2021 |                           |                  | 6,593,155           | 572,781                   | 1,121,684             | 8,734,034                           | \$ 17,021,654 |
| 10 | 2022 |                           |                  | 6,593,155           | 572,781                   | 1,177,769             | 9,170,735                           | \$ 17,514,440 |
| 11 | 2023 |                           |                  | 6,593,155           | 572,781                   | 1,236,657             | 9,629,272                           | \$ 18,031,865 |
| 12 | 2024 |                           |                  | 6,593,155           | 572,781                   | 1,298,490             | 10,110,736                          | \$ 18,575,162 |
| 13 | 2025 |                           |                  | 6,593,155           | 572,781                   | 1,363,434             | 10,616,273                          | \$ 19,145,623 |
| 14 | 2026 |                           |                  | 6,593,155           | 572,781                   | 1,431,585             | 11,147,086                          | \$ 19,744,607 |
| 15 | 2027 |                           |                  | 6,593,155           | 572,781                   | 1,503,164             | 11,704,441                          | \$ 20,373,541 |
| 16 | 2028 |                           |                  | 6,593,155           | 572,781                   | 1,578,322             | 12,289,663                          | \$ 21,033,921 |
| 17 | 2029 |                           |                  | 6,593,155           | 572,781                   | 1,657,239             | 12,904,146                          | \$ 21,727,320 |
| 18 | 2030 |                           |                  | 6,593,155           | 572,781                   | 1,740,101             | 13,549,353                          | \$ 22,455,390 |
| 19 | 2031 |                           |                  | 6,593,155           | 572,781                   | 1,827,106             | 14,226,821                          | \$ 23,219,862 |
| 20 | 2032 |                           |                  | 6,593,155           | 572,781                   | 1,918,461             | 14,938,162                          | \$ 24,022,559 |
| 21 | 2033 |                           |                  | 6,593,155           | 572,781                   | 2,014,384             | 15,685,070                          | \$ 24,865,390 |
| 22 | 2034 |                           |                  | 6,593,155           | 572,781                   | 2,115,103             | 16,469,323                          | \$ 25,750,362 |
| 23 | 2035 |                           |                  | 6,593,155           | 572,781                   | 2,220,858             | 17,292,789                          | \$ 26,679,584 |
| 24 | 2036 |                           |                  | 6,593,155           | 572,781                   | 2,331,901             | 18,157,429                          | \$ 27,655,266 |
| 25 | 2037 |                           |                  | 6,593,155           | 572,781                   | 2,448,496             | 19,065,300                          | \$ 28,679,733 |
|    | 2038 |                           |                  | 6,593,155           | 572,781                   | 2,570,921             | 20,018,565                          | \$ 29,755,422 |
|    | 2039 |                           |                  | 6,593,155           | 572,781                   | 2,699,467             | 21,019,494                          | \$ 30,884,897 |
|    | 2040 |                           |                  | 6,593,155           | 572,781                   | 2,834,440             | 22,070,468                          | \$ 32,070,845 |
|    | 2041 |                           |                  |                     |                           | 2,976,162             | 23,173,592                          | \$ 26,150,154 |
|    | 2042 |                           |                  |                     |                           | 3,124,970             | 24,332,691                          | \$ 27,457,662 |

25 Yrs Cumulative  
\$ 503,456,186

30 Yrs Cumulative  
\$ 649,775,166



KWA Supply Option Worksheet  
KWA-1

Capacity  
Flint ADD: 12 MGD 1,604 MCF/Day  
KWA ADD: 12 MGD 1,604 MCF/Day

Annual Volume  
Flint: 585,561 MCF  
KWA: 585,561 MCF

2016 Cost of Supply  
Flint WTP O&M: 13.51 /MCF \$ 7,913,118 /Yr  
KWA: \$ 1.50 /MCF \$ 878,869 /Yr

Escalation/Inflation Rate  
Flint: 4.51% /Yr  
KWA: 5.0% /Yr

Capital Expenditure

Capital: \$ 272,421,558  
Bond Issuance (2.25% of Total): 8,440,000 Check: 2.25%  
3 Years of Capitalized Interest: 56,000,000 Check: 5.0% /Yr (Bond Interest on Total)  
Reserve (10% of Total): 37,500,000 Check: 10.0%  
Total: \$ 374,361,558  
Flint's Share (30%): \$ 112,308,467

Revenue Bond Rate: 5%  
Number of Years: 25  
Annual Cost: \$7,968,562  
Interest on Reserve: 3%

Capital: \$ 7,758,362  
Bond Issuance (3% of Total): 240,000 Check: 2.25%  
3 Years of Capitalized Interest: 1,600,000 Check: 5.0% /Yr (Bond Interest on Total)  
Reserve (10% of Total): 1,070,000 Check: 10.0%  
Total: \$ 10,668,362

Revenue Bond Rate: 5%  
Number of Years: 25  
Annual Cost: \$256,946  
Interest on Reserve: 3%

David Guastella:  
Flint buys water from DWSD for three years during KWA construction at current rate (assume 5% increase each year)

David Guastella:  
Highlighted portion is Flint's Entry Fee to KWA

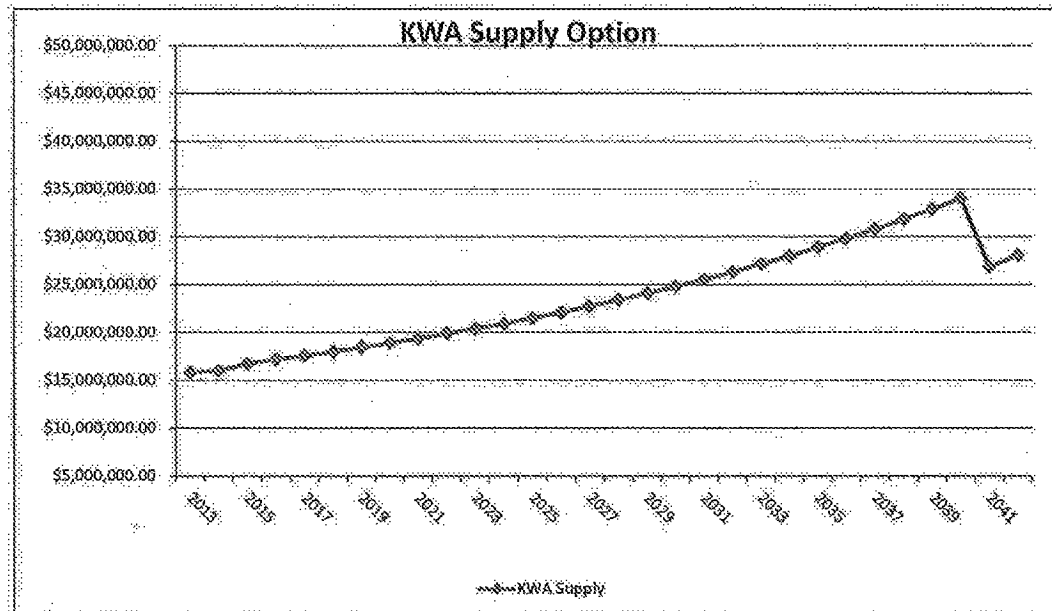
| Year     | Flint WTP O&M | Water Purchase | KWA Revenue: Pre-bond Entry Fee & Bond Payment | Flint Revenue: Bond Payment | Interest on Reserve | TOTAL         |
|----------|---------------|----------------|--|-----------------------------|---------------------|---------------|
| 1. 2013  | \$ 3,538,214  | 11,461,700     | 1,162,800                                      |                             | 369,600             | \$ 15,793,114 |
| 2. 2014  | \$ 3,697,788  | 12,034,785     | 581,400  |                             | 369,600             | \$ 15,944,373 |
| 3. 2015  | \$ 3,864,558  | 12,636,524     | 581,400  |                             | 369,600             | \$ 16,712,882 |
| 4. 2016  | \$ 7,913,118  | 878,869        | 7,968,562                                      | 756,946                     | 369,600             | \$ 17,147,896 |
| 5. 2017  | \$ 8,270,000  | 922,812        | 7,968,562                                      | 756,946                     | 369,600             | \$ 17,548,721 |
| 6. 2018  | \$ 8,642,977  | 968,953        | 7,968,562                                      | 756,946                     | 369,600             | \$ 17,967,838 |
| 7. 2019  | \$ 9,032,775  | 1,017,401      | 7,968,562                                      | 756,946                     | 369,600             | \$ 18,406,884 |
| 8. 2020  | \$ 9,440,153  | 1,068,271      | 7,968,562                                      | 756,946                     | 369,600             | \$ 18,864,332 |
| 9. 2021  | \$ 9,865,904  | 1,121,684      | 7,968,562                                      | 756,946                     | 369,600             | \$ 19,343,497 |
| 10. 2022 | \$ 10,310,857 | 1,177,769      | 7,968,562                                      | 756,946                     | 369,600             | \$ 19,844,533 |
| 11. 2023 | \$ 10,775,876 | 1,236,657      | 7,968,562                                      | 756,946                     | 369,600             | \$ 20,368,441 |
| 12. 2024 | \$ 11,261,868 | 1,298,490      | 7,968,562                                      | 756,946                     | 369,600             | \$ 20,916,266 |
| 13. 2025 | \$ 11,769,779 | 1,363,414      | 7,968,562                                      | 756,946                     | 369,600             | \$ 21,489,101 |
| 14. 2026 | \$ 12,300,596 | 1,431,585      | 7,968,562                                      | 756,946                     | 369,600             | \$ 22,088,089 |
| 15. 2027 | \$ 12,855,352 | 1,503,164      | 7,968,562                                      | 756,946                     | 369,600             | \$ 22,714,425 |
| 16. 2028 | \$ 13,435,129 | 1,578,322      | 7,968,562                                      | 756,946                     | 369,600             | \$ 23,369,359 |
| 17. 2029 | \$ 14,041,053 | 1,657,239      | 7,968,562                                      | 756,946                     | 369,600             | \$ 24,054,200 |
| 18. 2030 | \$ 14,674,305 | 1,740,101      | 7,968,562                                      | 756,946                     | 369,600             | \$ 24,770,313 |
| 19. 2031 | \$ 15,336,116 | 1,827,106      | 7,968,562                                      | 756,946                     | 369,600             | \$ 25,519,130 |
| 20. 2032 | \$ 16,027,775 | 1,918,461      | 7,968,562                                      | 756,946                     | 369,600             | \$ 26,302,144 |
| 21. 2033 | \$ 16,750,627 | 2,014,384      | 7,968,562                                      | 756,946                     | 369,600             | \$ 27,120,919 |
| 22. 2034 | \$ 17,506,080 | 2,115,103      | 7,968,562                                      | 756,946                     | 369,600             | \$ 27,977,092 |
| 23. 2035 | \$ 18,295,605 | 2,220,858      | 7,968,562                                      | 756,946                     | 369,600             | \$ 28,872,371 |
| 24. 2036 | \$ 19,120,737 | 2,331,901      | 7,968,562                                      | 756,946                     | 369,600             | \$ 29,808,546 |
| 25. 2037 | \$ 19,983,082 | 2,448,496      | 7,968,562                                      | 756,946                     | 369,600             | \$ 30,787,486 |
| 2038     | \$ 20,884,319 | 2,570,921      | 7,968,562                                      | 756,946                     | 369,600             | \$ 31,811,148 |
| 2039     | \$ 21,826,201 | 2,699,467      | 7,968,562                                      | 756,946                     | 369,600             | \$ 32,881,577 |
| 2040     | \$ 22,810,563 | 2,834,440      | 7,968,562                                      | 756,946                     | 369,600             | \$ 34,000,912 |
| 2041     | \$ 23,839,320 | 2,976,162      |  |                             |                     | \$ 26,815,482 |
| 2042     | \$ 24,914,473 | 3,124,970      |  |                             |                     | \$ 28,039,443 |

David Guastella:  
Assumes Bond Issuance and Reserve are not included

David Guastella:  
Increased by 3%/Yr to 2012 1%

25 Yrs Cumulative  
\$ 553,731,153

30 Yrs Cumulative  
\$ 707,279,715



KWA Supply Option Worksheet  
KWA-2

Capacity

Flint ADD: 12 MGD 1,604 MCF/Day  
KWA ADD: 12 MGD 1,604 MCF/Day

Annual Volume

Flint: 585,561 MCF  
KWA: 585,561 MCF

2016 Cost of Supply

Flint WTP O&M: \$ 13.51 /MCF \$ 7,913,118 /Yr  
KWA: \$ 1.50 /MCF \$ 878,869 /Yr

Escalation/Inflation Rate

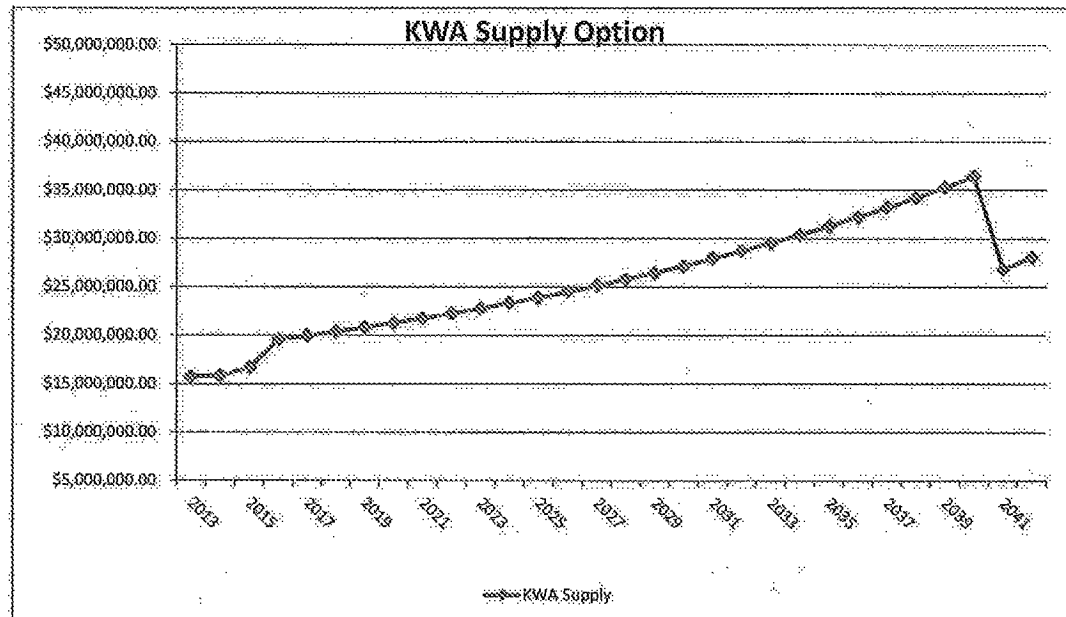
Flint: 4.51% /Yr  
KWA: 5.0% /Yr

Capital Expenditure

Capital: \$ 357,578,060  
Bond Issuance (2.25% of Total): 11,050,000 Check: 2.25%  
3 Years of Capitalized Interest: 74,000,000 Check: 5.0% /Yr (Bond Interest on Total)  
Reserve (10% of Total): 49,000,000 Check: 10.0%  
Total: \$ 491,628,060  
Flint's Share (30%): \$ 147,488,418  
Revenue Bond Rate: 5%  
Number of Years: 25  
Annual Cost: \$10,464,666  
Interest on Reserve: 3%

Capital: \$ 7,758,362  
Bond Issuance (3% of Total): 240,000 Check: 2.25%  
3 Years of Capitalized Interest: 1,600,000 Check: 5.0% /Yr (Bond Interest on Total)  
Reserve (10% of Total): 1,070,000 Check: 10.0%  
Total: \$ 10,668,362  
Revenue Bond Rate: 5%  
Number of Years: 25  
Annual Cost: \$756,946  
Interest on Reserve: 3%

| Year | Flint WTP O&M | Water Purchase | KWA Revenue Pre-bond Entry Fee & Bond Payment | Flint Revenue Bond Payment | Interest on Reserve | TOTAL         |
|------|---------------|----------------|---|----------------------------|---------------------|---------------|
| 2013 | \$ 3,538,214  | 11,461,700     | 1,182,800                                     |                            | 473,100             | \$ 15,689,614 |
| 2014 | \$ 3,697,788  | 12,034,785     | 581,400                                       |                            | 473,100             | \$ 15,840,873 |
| 2015 | \$ 3,864,558  | 12,636,524     | 581,400                                       |                            | 473,100             | \$ 16,609,382 |
| 2016 | \$ 7,913,118  | 878,869        | 10,464,666                                    | 756,946                    | 473,100             | \$ 19,540,500 |
| 2017 | \$ 8,270,000  | 922,812        | 10,464,666                                    | 756,946                    | 473,100             | \$ 19,941,325 |
| 2018 | \$ 8,642,977  | 968,953        | 10,464,666                                    | 756,946                    | 473,100             | \$ 20,360,442 |
| 2019 | \$ 9,032,775  | 1,017,401      | 10,464,666                                    | 756,946                    | 473,100             | \$ 20,798,688 |
| 2020 | \$ 9,440,153  | 1,068,271      | 10,464,666                                    | 756,946                    | 473,100             | \$ 21,256,936 |
| 2021 | \$ 9,865,904  | 1,121,684      | 10,464,666                                    | 756,946                    | 473,100             | \$ 21,736,101 |
| 2022 | \$ 10,310,857 | 1,177,769      | 10,464,666                                    | 756,946                    | 473,100             | \$ 22,237,137 |
| 2023 | \$ 10,775,876 | 1,236,657      | 10,464,666                                    | 756,946                    | 473,100             | \$ 22,761,045 |
| 2024 | \$ 11,261,868 | 1,298,490      | 10,464,666                                    | 756,946                    | 473,100             | \$ 23,308,870 |
| 2025 | \$ 11,769,779 | 1,363,414      | 10,464,666                                    | 756,946                    | 473,100             | \$ 23,881,705 |
| 2026 | \$ 12,300,596 | 1,431,585      | 10,464,666                                    | 756,946                    | 473,100             | \$ 24,480,693 |
| 2027 | \$ 12,855,352 | 1,503,164      | 10,464,666                                    | 756,946                    | 473,100             | \$ 25,107,029 |
| 2028 | \$ 13,435,129 | 1,578,322      | 10,464,666                                    | 756,946                    | 473,100             | \$ 25,761,963 |
| 2029 | \$ 14,041,053 | 1,657,239      | 10,464,666                                    | 756,946                    | 473,100             | \$ 26,446,804 |
| 2030 | \$ 14,674,305 | 1,740,101      | 10,464,666                                    | 756,946                    | 473,100             | \$ 27,162,917 |
| 2031 | \$ 15,336,116 | 1,827,106      | 10,464,666                                    | 756,946                    | 473,100             | \$ 27,911,733 |
| 2032 | \$ 16,027,775 | 1,918,461      | 10,464,666                                    | 756,946                    | 473,100             | \$ 28,694,748 |
| 2033 | \$ 16,750,627 | 2,014,384      | 10,464,666                                    | 756,946                    | 473,100             | \$ 29,513,523 |
| 2034 | \$ 17,506,080 | 2,115,103      | 10,464,666                                    | 756,946                    | 473,100             | \$ 30,369,696 |
| 2035 | \$ 18,295,605 | 2,220,858      | 10,464,666                                    | 756,946                    | 473,100             | \$ 31,264,975 |
| 2036 | \$ 19,120,737 | 2,331,901      | 10,464,666                                    | 756,946                    | 473,100             | \$ 32,201,150 |
| 2037 | \$ 19,983,082 | 2,448,496      | 10,464,666                                    | 756,946                    | 473,100             | \$ 33,180,090 |
| 2038 | \$ 20,884,319 | 2,570,921      | 10,464,666                                    | 756,946                    | 473,100             | \$ 34,203,752 |
| 2039 | \$ 21,826,201 | 2,699,467      | 10,464,666                                    | 756,946                    | 473,100             | \$ 35,274,181 |
| 2040 | \$ 22,810,563 | 2,834,440      | 10,464,666                                    | 756,946                    | 473,100             | \$ 36,393,516 |
| 2041 | \$ 23,839,320 | 2,976,162      |   |                            |                     | \$ 26,815,487 |
| 2042 | \$ 24,914,473 | 3,124,970      |   |                            |                     | \$ 28,039,443 |

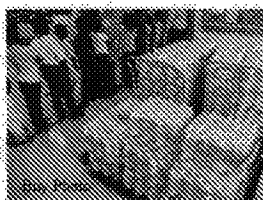


25 Yrs Cumulative  
\$ 606,057,940

30 Yrs Cumulative  
\$ 766,784,313

# Chemical testing could have predicted Flint's water crisis

By John Wisely and By Robin Erb, Detroit Free Press 7:44 am EDT October 11, 2015



(Photo: Ryan Garza, Detroit Free Press)

Chemical tests could have predicted the corrosion in the pipes that is now being blamed for endangering the health of thousands of vulnerable Flint residents by elevating lead levels in their water supply, experts say.

As the city scrambles to reconnect to the Detroit water system, the absence of such testing on the Flint River water is one of many missed opportunities that might have lessened or avoided the crisis, they say.

"Any competent person should have seen this water will eat up iron and eat up lead," Marc Edwards, a Virginia Tech professor and national expert on pipe corrosion, told the Free Press. Edwards said his own research shows that Flint River water, without additional controls, corrodes the lead inside pipes at 18 times the rate of water piped from Detroit.



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Why are lead levels in children higher in 2 Flint ZIP codes?

<http://www.freep.com/story/news/local/michigan/2015/10/10/lead-danger-basics/73683934/>

Among red flags that popped up over the last 18 months:

- General Motors announced in October 2014 that it was pulling its engine plant off Flint water after workers there began noticing rust spots on newly machined parts. The city approved letting GM switch to water from Flint Township, but didn't change its own water treatment procedures.
- The University of Michigan-Flint alerted city officials that it found elevated lead levels in its water in January, prompting the school to shut off some drinking fountains and add water filters to others.
- Testing in the fall of 2014 found E. coli in the city's water system, prompting "boil water" notices. The city's procedures for killing the E. coli produced chemical by-products known as trihalomethanes, which can cause cancer with long-term exposure. The city had to adopt additional measures to reduce them.

"Common sense tells you that the Flint River is not your first choice of drinking water," said Shawn McElmury, who teaches civil and environmental engineering at Wayne State University and has followed Flint closely.



DETROIT FREE PRESS

Q & A on Flint's water troubles

<http://www.freep.com/story/news/local/michigan/2015/10/10/flint-water-qa/73693500/>

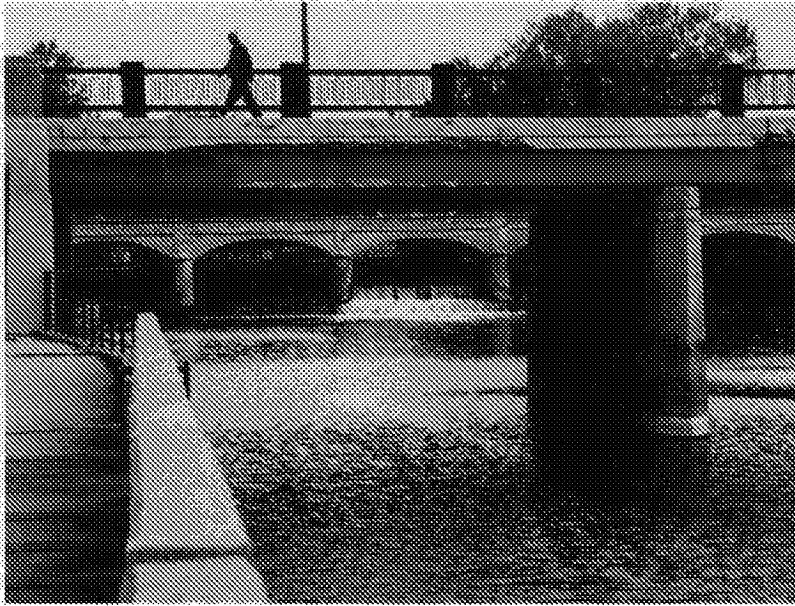
Experts say the testing could have been done before the switch from the Detroit system. But officials, from the Michigan Department of Environmental Quality note that that kind of testing isn't required under federal drinking-water rules and has never been done in Michigan. What's more, they said, the Flint River water, treated in the city's plant, was already approved as a backup supply in case of interrupted service from Detroit.

Other experts said the testing is more nuanced, part art and part science. Still, they acknowledge that by examining things such as the acidity of water and other factors, engineers could have estimated how much corrosion to expect once water from the Flint River was pumped into homes and businesses across the city.

"Not every engineer in our field could do it, it's a pretty specialized area," said David Cornwell, a Virginia-based engineering consultant and a technical adviser to the National Drinking Water Advisory Council, a group of experts that works with the Environmental Protection Agency on drinking water issues.

DETROIT FREE PRESS

Flint doctor makes state see light about lead in water



A man crosses a bridge over the Flint River near the Hamilton Dam in downtown Flint on Thursday, Oct. 8, 2015. Flint has been getting its drinking water from the river since last year. (Photo: Ryan Garza, Detroit Free Press)

#### Flint River water a challenge to clean up

Flint River water was always going to pose more treatment challenges than the cold, clear water that comes from the bottom of Lake Huron, experts said.

The river has been marked by decades of industrial pollution. Its tributaries channel farmland run-off into it and its temperature varies by season. Warmer water can promote bacteria growth. All of those factors make treating it to drinking-water standards more difficult.

"The city was doing the best it could" to clean up pollutants, Edwards said, but added that corrosivity was inevitable.

He blamed the problems on a lack of expertise rather than intentional wrongdoing.

"I think it started relatively innocently. They didn't understand testing and they didn't understand corrosivity," he said.

Last month, Edwards' research group released results of corrosion tests it conducted on Flint's water. For the test, researchers used copper pipe with lead solder, which is common in older homes.

The tests showed Flint River water without added phosphates corroded the lead at 19 times the rate of Detroit water. Even when phosphates were added, it corroded at 16 times the rate of the Detroit water.

"From the second it was switched, it was doomed from the lead problem," Edwards said.

When residents began complaining about the water, the city and state should have begun to rethink their testing, Edwards said.

Problems were evident soon after the switch.

In August last year, E. coli was found in the water and residents were urged to boil it before drinking it. The city treated it with disinfectant, but that produced by-products in the water known as trihalomethanes. Long-term exposure to them can cause cancer, so the city began making treatment adjustments.

Then as summer turned to fall, workers at Flint's GM engine plant began seeing rust on newly machined engine parts. GM's lab tests found high levels of chloride in the water used to wash down metal shavings and cool parts heated from the rapid machining action inside the plant, GM spokesman Tom Wickham said.

GM tried to treat the water in the plant. It had drinking water delivered and tankers brought water for operations, Wickham said.

But it eventually sought to connect to Flint Township's water system, which is supplied by Detroit.

In December the connection was finalized and Detroit water began flowing to the plant, via Flint Township.





<http://www.freep.com/story/news/local/michigan/2015/10/10/hanna-attisha-profile/73600120/>

The fix now will cost \$12 million — a combination of money from the state, the city and the Flint-based non-profit C.S. Mott Foundation, which has pledged \$4 million to help pay Detroit for the water while Flint waits to connect to a new water authority in partnership with Genesee County.

#### **Water woes began shortly after switch from Detroit**

Flint began using Flint River water as its main supply in April 2014. Before that, it bought Lake Huron water that was treated and delivered by the Detroit Water and Sewerage Department. Detroit ended that deal one day after Flint voted to join Genesee County in forming the Karegnondi Water Authority, which plans to build its own Lake Huron intake and pipe the water to the Flint Water Plant.

Flint officials wanted to remain on Detroit's system, but the two sides couldn't agree on a price and a contract length.

Once the switch to river water was made, the city, which was operating under a state-appointed emergency financial manager, faced one problem after another. Residents packed city council meetings and held protest marches to voice their anger about water quality.

Experts say Flint's lead problems could have been held in check if the city had added phosphates to the water, as Detroit has done for years. The treatment doesn't eliminate lead entirely, but it does form a film over the pipes themselves, effectively sealing in the lead and reducing the amount in the water to acceptable levels.

But when Flint switched to river water, it didn't add phosphates. Instead it added lime to soften the water.

"The lime softening process has the added benefit of some corrosion control," said Liane Smith, chief of Michigan's Office of Drinking Water and Municipal Assistance.

Smith said that once the switch was made, the state began testing for lead and copper, as is required by the federal Environmental Protection Agency.

"Any new supply that comes along has to do two six-month rounds of monitoring for lead and copper out in their distribution system," Smith said. If those tests show corrosion, additional steps, such as perhaps adding phosphates, are supposed to be followed.

The first round of testing completed in December 2014 showed lead levels of 6 parts per billion. The second round, completed in June of this year, showed they had almost doubled to 11 parts per billion. The EPA requires a remediation plan when levels reach 15 parts per billion and can demand action even below that mark on systems that serve more than 50,000 people.

Cornwell said phosphates are considered more effective than lime softening and they don't raise treatment costs substantially. But they have side effects, he said.

"The negative is that nobody really likes phosphates out in the environment," he said, noting they can find their way into rivers and lakes, fueling algae blooms such as the ones in Lake Erie.

"There is more to it than saying we're just going to pump phosphates," Cornwell said. "You may have to make other adjustments."



In January 2015, lead was showing up at the University of Michigan's Flint campus. School leaders become concerned about the water supply after the city issued "boil water" advisories to kill E. coli and realized they'd never done routine, thorough water testing.

Tests in January and February showed elevated levels of lead and other problems in isolated areas —specifically in two infrequently used drinking fountains in two older buildings.

Follow-up testing found other elevated levels of lead, and those sinks and fountains then were either fitted with filters or removed, said Mike Lane, director of the environment, health and safety department.

He said officials suspected the problem was in their pipes but notified the city anyway.

In June, Miguel Del Toral of the Environmental Protection Agency drafted an internal memo noting the problems Flint had experienced with E. coli and the by-products of the chemicals used to treat it.

"A major concern from a public health standpoint is lack of corrosion control treatment in the city of Flint for mitigating lead and copper levels in the drinking water," Del Toral wrote.

The memo caused a stir when the American Civil Liberties Union exposed it. But the EPA told the Free Press on Friday that the memo was a draft that was never delivered to MDEQ officials, including Smith, whose names appear on it.

The EPA did say it discussed the concerns raised in the memo with MDEQ officials in July, but the agency did not respond immediately to a request for details.

## Leaching lead not unique to Flint

The problem of lead leaching into drinking water isn't unique to Flint. Across Michigan and around the country, pipes that carry water from the mains under the street into homes, businesses and schools often contain lead. Inside homes and business, many older plumbing fixtures and soldered pipes also contain it.

Cornwell said officials from across the nation have formed a working group to review the lead and copper rules and look for ways to improve them. Among the things being considered is a national effort to remove lead pipes from water systems.

But even if a national consensus formed around that idea, the process would take years, Cornwell said. A funding source for such a massive project also would be needed.

Still, he said, removing the pipes is the only surefire way to eliminate lead from the system.

"We can only do so much with water chemistry," he said. "We can only turn the knob so much."

Contact John Wisely: 313-222-6825 or [jwisely@freepress.com](mailto:jwisely@freepress.com)

Contact Robin Erb: 313-222-2708 or [rerb@freepress.com](mailto:rerb@freepress.com).

## TIME LINE

April 16, 2013: Flint signs agreement to join the Karegnondi Water Authority.

April 17, 2013: Detroit terminates contract with Flint, giving it one year to find a new water source.

April 24, 2014: Flint switches from Detroit water to Flint River water.

April 30, 2014: Flint closes all valves connecting to Detroit water supply.

June-Sept. 2014: Flint residents complain about smell, taste and discoloration of water.

Dec. 16, 2014: Michigan Department of Environment Quality cites Flint for exceeding limits on disinfection by-products.

Dec. 27, 2014: Flint's General Motors engine plant, citing high chloride levels in the water, switches off its hook-up to Flint, drawing water instead from neighboring Flint Township.

Jan. 9, 2015: Concerned about Flint's water warnings, University of Michigan's Flint campus begins testing its water, detecting lead in isolated,

infrequently used areas.

June 24, 2015: Environmental Protection Agency drafts a report raising concerns about lead in Flint's water system as a result of corrosion. It doesn't send the report, but discusses its concerns with MDEQ officials in July.

Sept. 24, 2015: Dr. Mona Hanna-Attisha releases data showing spike in blood-lead levels in Flint children.

Oct. 2, 2015: State officials tell room packed with reporters that there's a problem with Flint's water.

Read or Share this story: <http://on.freep.com/1LoJP7S>

## Woosley, Rosemary (DEQ)

**From:** dganit.eichen@MOH.GOV.IL  
**Sent:** Thursday, January 07, 2016 10:05 AM  
**To:** nowotarski.allison@epa.gov; DEQFOIA  
**Cc:** IRIT.HEN@MOH.GOV.IL  
**Subject:** Corrosion control measures and Water Stabilization

1643-16  
RMD  
Lansing  
Due: 2-1-16

Hello Allison,

I am an Information Specialist for the Ministry of Health in Israel.

In Israel, more than 50% of the water are Desalinated and we require that a supplier who is desalinating water or is otherwise treating the water in a manner causing changes in acidity or alkalinity of the water, shall provide for the stabilization of the water.

Following the Lead contamination in Flint we would very much appreciate receiving information regarding the corrosion control measures that were taken and how you define unstabilized water. In Israel we suffer from opposite problems – too much scale.

We are also interested in the stabilization values of the water in Flint: before changing the source of the water to the Flint river and after the change: Soluble Calcium (mg/L as CaCO<sub>3</sub>), Alkalinity (mg/L as CaCO<sub>3</sub>), Stabilization value CCPP (mg/L as CaCO<sub>3</sub>), Stabilization value (Langelier Index), TDS, pH.

Following are the Israeli Stabilization values for Desalinated water:

| Column A<br>Type of monitoring | Column B<br>Sampling point      | Column C<br>The factor                 | Column D<br>Unit of measurement | Column E<br>Required level<br>Operational Value  |
|--------------------------------|---------------------------------|--|---------------------------------|--|
| Continuous                     | Exit from<br>Desalination plant | Conductivity                           | Micro Siemens per<br>centimeter | In 95% of daily<br>measurements and<br>not more than 10%<br>above the<br>operational value<br>0.9 and below in<br>95% of daily<br>measurements, and<br>not more than 1.0<br>7.5-8.5 in 95% of<br>the daily<br>measurements, and<br>not more than 9.5<br>80-120 ° |
|                                | Exit from<br>"Reverse osmosis"  | Turbidity                              | NTU                             |  |
|                                |                                 | Acidity/Alkalinity                     | pH                              |  |
| Grab Sample                    | Exit from<br>"Reverse osmosis"  | Soluble Calcium                        | Mg/L as CaCO <sub>3</sub>       | 20 and above   |
|                                |                                 | Alkalinity                             | Mg/L as CaCO <sub>3</sub>       | 10 and above   |
|                                |                                 | Stabilization value<br>CCPP            | Mg/L as CaCO <sub>3</sub>       | 10 and above   |
|                                |                                 | Stabilization value<br>Langelier Index | and                             | 0 and above  |

[http://www.health.gov.il/Subjects/Environmental\\_Health/drinking\\_water/Documents/Briut47-Eng.pdf](http://www.health.gov.il/Subjects/Environmental_Health/drinking_water/Documents/Briut47-Eng.pdf)

Regards,

Dganit Eichen  
Information Specialist and Env. Eng.  
Environmental Health Dept.  
Israel Ministry of Health



## Busch, Stephen (DEQ)

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**From:** Busch, Stephen (DEQ)  
**Sent:** Friday, May 01, 2015 2:38 PM  
**To:** Ann Newell (AnnNewell@hurleymc.com)  
**Subject:** Water Safety Plan/HACCP Information  
**Attachments:** WHO-LegionellaAndPreventionOfLegionellosis-2007.pdf; WHO-WaterSafetyInBuildings-2011.pdf; EPA Small Systems Webinar Series\_April 28\_2015.pdf; VHA Directive 1061 - Prevention of Healthcare associated Legionella 8-2....pdf

Ann,

As promised I am providing additional information regarding Water Safety Plans and Hazard Analysis Critical Control Points (HACCP) system.

Attached are two documents from the World Health Organization regarding Legionella and the development of water safety plans. Both have information specific to health care facilities. Also attached is the latest VHA directive to their facilities regarding protocols for the prevention of legionella. And the last attachment is from an EPA webinar earlier this week regarding Healthcare water systems. The later portion of this document contains information regarding various treatment systems.

The video linked below reviews the HACCP/Water Safety Plan process steps. (*Best Practices in Preventing Disease From Waterborne Pathogens in Healthcare Water Systems*):

<https://youtu.be/LHqU2YSaag0>

The basic Implementation Protocol is as follows:

1. Establish an HACCP team (responsible and accountable)
2. Describe the water system(s)
3. Develop the process flow diagrams
4. Confirm process flow diagrams with onsite audits
5. Perform systematic hazard analysis and risk characterization
6. Determine critical control points
7. Establish critical control limits (quantitative parameters)
8. Monitoring Methods and Frequencies
9. Develop Corrective Actions
10. Verification of HACCP implementation
11. Verification of hazard control
12. Documentation, communication, and recordkeeping

Al Kubly, Section Head of Facilities Operations, Mayo Clinic, would be an excellent contact on how to develop your water safety plan/HACCP. He chairs their Water Management Team that is implementing the Mayo Clinic's Potable Water Quality Program, which he spoke about at a recent conference. The Clinic phone number in Rochester, MN is 507-284-2511.

As noted in the EPA presentation and as we have previously discussed, should your facility decide to install water treatment equipment, it may constitute a public water system triggering requirements under the safe drinking water act. Our office would need to permit any such treatment equipment prior to installation and use.

Please let me know if you are in need of any further assistance or have any questions regarding these matters.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

# Gov. Needs Briefing on Flint Sit.

- BWA - Address it

Current ①. Source?

Case - evidence of contamination

if correct - direct evic. of

1st - <sup>general</sup> contamination  
2nd - no correct

SUMMARY

- Old system - large old pipes
- Flow lines
- stagnation
- fluctuations
- Dist. line - less effective chlorine residuals
- ~~corrosion~~ / water renewal / old pipes / breaks
- solution → Ev. some of contamination.

1 1/2 days

②

2nd? → Process of issuing a BWA?

\* - self initiated by CWS

- DER - results - then BWA is necessary

Who made the call w/rt Flint → collective

hit 5% RCL → IN for spec. long 30 days

BUT E. Coli → 24 hr notice

\* PAH Total <sup>coliform</sup> std → EPA → adopted by MI.

Back in 92 → if hits trigger → state has

authority to act. BWA / self or collective

We have policy on issuance of BWAs

\* initiated → corrective meas. necessary

contaminant samples - 2 sets 24 hrs apart  
if w/o MCL

1 set if @

- spelled out Monitoring Regs  
for dist system

History <sup>3</sup> — switched on 4/25/14 From DWSD  
met w/ gov. 2013 (April) — Flint wanted to use  
Flint River & appeared to  
pull away from DWSD  
& be on Lake Huron by 2016

Lost issue

MGT of WTP → Pat. for further BWA?

Tot 500 July - Sept ↑ inc. of TCR Vids

— warm conditions  
—

— mid next week

Next Tues

\* Public Relations — Bill White — leads Matt  
Foundations

Concerns/ mistrust w/rt water system.

IS it SAFE?

Ability to manage problem

Likelihood to happen again

3rd Party verification

Willing to hire 3rd party!  
Was it correct decision to leave DWSD?

Summarize up to this point

State work would be on way

State add

→ Add. stuff Matt could do to help out in  
dist. system → invest in research to help  
support the local comm.

Service lines (lead)

Summary ↓

Briefing Message to  
Gov



Current status

Process

History



Summary in 3 parts

1. Summary of the DW STAs
2. Procedures in flight - DEL
3. Engage locals



Benzie, Richard (DEQ)

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**From:** Monosmith, Carrie (DEQ)  
**Sent:** Thursday, March 19, 2015 8:22 AM  
**To:** Shekter Smith, Liane (DEQ); Benzie, Richard (DEQ)  
**Cc:** Busch, Stephen (DEQ)  
**Subject:** FW: MHA & Michigan DEQ re: McLaren-Flint Water Treatment to Prevent Legionella  
**Attachments:** MHA & Michigan DEQ re McLaren-Flint Water Treatment to Prevent Legionella .ics  
**Importance:** High

I have finally been able to set up a conference call with some of the members of the Michigan Hospital Association. However, I do believe they are more interested in what is happening in Flint rather than the regulatory aspects of secondary treatment. Unfortunately, this meeting can only be held at 3 PM this afternoon, or else it will wait at least 2 more weeks because one of their participants will be out of the country.

I worked with Janice Jones, MHA, to get this set up. I did tell her that we would try to do it today, but it may have to be cancelled because the key people here all had meeting conflicts. (It conflicts with the Region 5 PWSS State call.) I don't mind handling the call, but I don't know the current Flint situation or enough of the particulars on the Legionella outbreak there to adequately answer their questions. Liane & Richard—if you can't participate, perhaps Steve Busch and I could meet with them. Please let me know what you would like to do so that if this needs to be postponed I won't be doing it at the last minute, thanks-Carrie

**Benzie, Richard (DEQ)**

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Benzie, Richard (DEQ)

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**From:** Monosmith, Carrie (DEQ)  
**Sent:** Thursday, March 19, 2015 8:59 AM  
**To:** Shekter Smith, Liane (DEQ); Benzie, Richard (DEQ)  
**Cc:** Busch, Stephen (DEQ)  
**Subject:** RE: MHA & Michigan DEQ re: McLaren-Flint Water Treatment to Prevent Legionella

The call is cancelled. We are going to try and reschedule in April.--Carrie

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**From:** Monosmith, Carrie (DEQ)  
**Sent:** Thursday, March 19, 2015 8:21 AM  
**To:** Shekter Smith, Liane (DEQ); Benzie, Richard (DEQ)  
**Cc:** Busch, Stephen (DEQ)  
**Subject:** FW: MHA & Michigan DEQ re: McLaren-Flint Water Treatment to Prevent Legionella  
**Importance:** High

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RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



DAN WYANT  
DIRECTOR

October 30, 2015

VIA E-MAIL and U.S. MAIL

Mr. Mike Glasgow  
Utilities Administrator  
City of Flint  
4500 North Dort Highway  
Flint, Michigan 48505

Dear Mr. Glasgow:

SUBJECT: Water Supply – City of Flint (City) – Corrosion Control Treatment Operation

The purpose of this letter is to outline additional requirements and recommendations regarding the additional corrosion control treatment measures being taken by the City water system.

The City has been purchasing drinking water from the Detroit Water and Sewerage Department (DWSD)/Great Lakes Water Authority (GLWA) since Friday, October 16, 2015. DWSD/GLWA provides corrosion control treatment to its water and DWSD/GLWA has been deemed by the Michigan Department of Environmental Quality (MDEQ) to have fully optimized corrosion control treatment. This optimization requires DWSD/GLWA to provide orthophosphate addition, maintain a minimum dose of 0.9 milligrams per liter (mg/L) as  $\text{PO}_4$ , and maintain a DWSD/GLWA plant tap residual of 0.8 mg/L as  $\text{PO}_4$ . As part of its optimization, DWSD/GLWA is also required to maintain a minimum pH of 7.0 at the DWSD/GLWA plant tap.

Corrosion Control Treatment and Operation

To further enhance pipe passivation in the City water distribution system, customer service lines, and customer plumbing, **the City shall dose additional orthophosphate to increase distribution system phosphate residual to a minimum of 3.1 mg/L as  $\text{PO}_4$  (1.0 mg/L as P).** The City has obtained a Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), water system construction permit for the installation of this treatment equipment at Control Station 2 and Pump Station 4, construction permit number W151104, issued on October 28, 2015.

The City should also maintain a minimum pH level of 7.0 throughout the City's water distribution system. If pH levels of 7.0 or less are detected, the City shall immediately notify the MDEQ.

**As part of the City water system operations, the City shall conduct:**

- **Daily monitoring of incoming DWSD/GLWA water for pH and for orthophosphate residual, as  $\text{PO}_4$**
- **Daily monitoring of additional orthophosphate dosage, as  $\text{PO}_4$**
- **Daily monitoring of water entering the City distribution system for pH and for orthophosphate residual, as  $\text{PO}_4$**

This information shall be included in the City's monthly operation report and shall be reported to the MDEQ as required under Administrative Rule 1502 (R 325.11502) of the administrative rules promulgated pursuant to Act 399.

### **Enhanced Water Quality Parameter Monitoring**

The City's revised monitoring schedule dated October 22, 2015, requires quarterly Water Quality Parameter Monitoring at 25 sites throughout the City's water distribution system for temperature (Celcius), Conductivity (mS), pH, Total Alkalinity (mg/L as  $\text{CaCO}_3$ ), Calcium (mg/L as  $\text{Ca}^{2+}$ ), and orthophosphate (mg/L  $\text{PO}_4$ ). Ten of these 25 sites are also used by the City to conduct required total coliform bacteria and chlorine residual monitoring (location numbers 1, 2, 3, 4, 5, 6, 7, 8, CS, and WS). **At these ten locations, the City shall also conduct weekly monitoring for the following parameters at the same time that total coliform bacteria and chlorine residual monitoring is conducted to further assess water stability:**

- Turbidity (NTU)
- Iron (mg/L)
- Orthophosphate (mg/L  $\text{PO}_4$ )
- pH
- Total Alkalinity (mg/L as  $\text{CaCO}_3$ )
- Calcium (mg/L as  $\text{Ca}^{2+}$ )
- Chloride (mg/L as  $\text{Cl}^-$ )
- Temperature (Celcius)
- Conductivity (mS)

In addition to the 10 locations, the entry point to the distribution system should be one of the locations for enhanced water quality parameter monitoring.

If orthophosphate residual levels less than 3.1 mg/L as  $\text{PO}_4$  (1.0 mg/L as P) are detected at any of these locations, then orthophosphate dosage shall be increased to achieve the minimum phosphate residual of 3.1 mg/L as  $\text{PO}_4$  (1.0 mg/L as P) at all locations. In addition, if pH levels of 7.0 or less are detected at any of these locations, the City shall immediately notify the MDEQ.

### **Corrosion Control Treatment Test Loops**

To further confirm the effectiveness of corrosion control treatment and the City's operations, it is recommended that the City construct, install, and monitor test loops of service line and plumbing materials. Instructions for construction, installation, and monitoring of these test loops can be obtained from the United States Environmental Protection Agency's (U.S. EPA) Office of Research and Development. The U.S. EPA has also offered to provide analytical services to support this investigative effort. Please contact Mr. Darren Lytle, Acting Branch Chief, at 512-569-7432 or [lytle.darren@epa.gov](mailto:lytle.darren@epa.gov).

### **Lead Service Line Verification Sampling**

The City has been reviewing customer service connection records in order to confirm customer service line materials at each connection. The U.S. EPA has developed a sampling procedure that can be used to help verify the presence of lead service lines and it is recommended that the City conduct this sampling at a selection of customer locations for this purpose. Information regarding this verification sampling can also be obtained from Mr. Lytle. Any water analysis for samples meeting the criteria for inclusion in the 90<sup>th</sup> percentile calculation for lead and copper compliance must be completed by a certified laboratory.

**Customer Household Exposure Assessment**

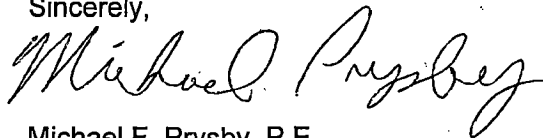
The Michigan Department of Health and Human Services (MDHHS) is continuing to conduct blood lead level testing for children in the City. Families with children found to have elevated blood lead levels will be asked to have an elevated blood lead level investigation conducted at their residence that will include a lead exposure assessment, including the contribution of lead from water service lines and premise plumbing. This diagnostic testing is different than the first draw sampling being conducted by the City and should help further substantiate the effectiveness of corrosion control treatment. Any water analysis samples meeting the criteria for inclusion in the 90<sup>th</sup> percentile calculation for compliance purposes for lead and copper must be completed by a certified laboratory.

**Flint Water Treatment Plant Evaluation of Karegnondi Water Authority (KWA) Raw Water**

The City is planning to change source water in the next year to raw water from Lake Huron purchased from the KWA. The City is required to evaluate the Flint Water Treatment Plant (WTP) processes related to optimization of corrosion control treatment using source water purchased from the KWA to determine if any adjustments are necessary. It is recognized that full scale testing at the Flint WTP may not be feasible. A report of this evaluation shall be provided to our office for review and approval prior to initiating service of this treated water to its customers.

If you have any questions regarding this correspondence, please contact me at the number below or at prysbym@michigan.gov.

Sincerely,



Michael F. Prysby, P.E.  
District Engineer  
Field Operations Section  
Office of Drinking Water and  
Municipal Assistance  
517-290-8817

cc: Mr. Brent Wright, City of Flint  
Mr. Howard Croft, City of Flint  
Ms. Natasha Henderson, City of Flint  
Mr. Darren Lytle, U.S. EPA  
Mr. Samir F. Matta, P.E., Lockwood, Andrews & Newnam, Inc.  
Mr. Warren Green, Lockwood, Andrews & Newnam, Inc.  
Mr. James Henry, Genesee County Health Department  
Dr. Linda Dykema, MDHHS  
Mr. Jim Sygo, Chief Deputy Director, MDEQ  
Mr. Stephen Busch, MDEQ  
Mr. Adam Rosenthal, MDEQ

Michigan Department of  
Environmental Quality  
Community Water Supply

Information Regarding  
Total Trihalomethane (TTHM)  
Disinfection Byproducts

# DEQ - Community Water Supply

- Regulatory Authority over Public Water Systems
- Michigan Safe Drinking Water Act
- 1400 Community Supplies in MI (like Flint)
- Lansing Jackson Districts – 300 in 13 counties
- Oversight through:
  - Inspection
  - Monitoring
  - Construction Permitting
  - Planning
- Partnership and Compliance Assistance



# What are TTHM's

- Trihalomethanes occur when natural organic matter in the water react with chlorine disinfectants.  
(Byproduct of disinfection process)

4 Chemical Compounds made up of these elements:

- Carbon
- - Hydrogen
- Bromine
- Chlorine

# TTHM Standard

- Based on chronic exposure to low doses
- 80 parts per billion (0.080 ppm)
- Locational Running Annual Average (LRAA)
- Quarterly monitoring at each location
- Location and timing based on highest risk
- Running = over last 4 quarters, not calendar yr
- Total sum of 4 quarters not to exceed 320 ppb

# Flint TTHM Results

| TTHM Results (mg/L)                          |              |              |              |              |              |
|--|--------------|--------------|--------------|--------------|--------------|
|  | 5/21/14      | 8/21/14      | 11/20/14     | LRAA         | OEL          |
| DBP1 McDonalds<br>3719 Davison               | <b>0.162</b> | <b>0.145</b> | 0.059        | <b>0.092</b> | <b>0.106</b> |
| DBP2 Liquor Palace<br>3302 S. Dort Highway   | <b>0.112</b> | <b>0.127</b> | 0.033        | 0.068        | 0.076        |
| DBP3 North Flint Auto<br>6204 N. Saginaw St. | <b>0.097</b> | <b>0.118</b> | 0.041        | 0.064        | 0.074        |
| DBP4 University Market<br>2501 Flushing Road | <b>0.106</b> | <b>0.196</b> | <b>0.094</b> | <b>0.099</b> | <b>0.122</b> |
| DBP5 Taco Bell<br>3606 Corunna Road          | 0.079        | <b>0.181</b> | 0.034        | 0.074        | <b>0.082</b> |
| DBP6 Rite-Aid<br>Pharmacy<br>5018 Clio Road  | <b>0.088</b> | <b>0.144</b> | 0.054        | 0.072        | <b>0.085</b> |
| DBP7 Salem Housing<br>3216 MLK Boulevard     | <b>0.082</b> | <b>0.112</b> | 0.050        | 0.061        | 0.074        |
| DBP8 BP Gas Station<br>822 S. Dort Highway   | 0.075        | <b>0.112</b> | 0.036        | 0.056        | 0.065        |

# Potential Health Effects Related to TTHM

- Federal Language
- Some people who drink water containing TTHM in excess of the MCL over many years could experience liver, kidney, or central nervous system problems and increased risk of cancer.

# Health Effect Basis by EPA

- Toxicology Studies - Uncertainty in using results of high-dose studies in animals to estimate risk to humans from chronic exposure to low doses in drinking water
- Epidemiology – Findings are contradictory. No conclusion of causal link between exposure and health effects.
- EPA determined evidence supports a potential hazard concern and establishment of standard.
- Considered best course of action at this time to reduce potential risks.

# TTHM Violation Requirements

- Water supply must take steps to reduce the amount of TTHM so that they are below the standard.
- Water supply must notify customers of the violation within 30 days of after learning of the violation.

# Operational Evaluation

- System treatment practices
- System distribution practices
- Storage tank operations
- Excess storage capacity
- Distribution system flushing
- Source water quality
- Treatment changes
- TTHM contributions
- Steps to minimize future standard violations

# Public Notification

- Designed to provide information to the customer to make more informed decisions
- Short term exposure to long term contaminant has different impact on each individual based on their background
- If health effects had been acute notification would be provided in 24 hours with specific actions for customers





## Proposed Bray Road Lime Sludge Management Plan

### 1. Introduction

The City of Flint plans to utilize their existing WTP to provide water on a continuous basis. The city plans to treat water from the Flint River until construction of the proposed KWA supply system is complete and the WTP can then be used to treat water from Lake Huron. Until then, The City of Flint will be utilizing the Bray Road Disposal site to pump lime sludge for interim storage with decant water being pumped into the City of Flint sanitary sewer system. The Flint River and consequently the Bray Road facility will be utilized during the KWA Supply System era for emergencies or to supplement water supply demands beyond current max day provided by KWA.

### 2. Proposed Lime Sludge Management Plan

LAN has been working with the City to evaluate, design and implement a lime residuals disposal plan to handle softening sludge for the interim period and long term operation of using the Flint River as a water source. The most feasible option is the use of Bray Road lagoon which was constructed in 1958. The site has been used intermittently since then during select test runs by the City. However, a concern by the MDEQ about unauthorized discharges into the neighboring stream and disposal of street sweeping, concrete and asphalt chunks has made this site off limits for the time being. Our team is working with City staff to develop a preliminary work plan and schedule that will address the concerns of the MDEQ and allow the use of the site for continued discharges of lime sludge in the interim basis and in the long run when emergencies and supplemental water supply require the use of lime softening at the water treatment plant.

### EXISTING SYSTEM

The most common sludge dewatering method is use of lagoons to settle the lime sludge and decant the water. The lime sludge from the water treatment clarifiers is transferred by pipe to a dewatering lagoon, e.g. at the Bray road site. The pipe network for the discharge line into the Bray Road site consists of an 8" pipe with multiple discharge feeders with valves that distributes the flow of the lime sludge into the dewatering lagoon. This facility has one large dewatering lagoon and one small lagoon for decant water. The two are separated by a dike and a concrete structure with an adjustable stop log system that controls the flows between the two lagoons. The large dewatering lagoon is capable of decanting the water on top of the sludge (supernatant) to the adjacent small lagoon for discharge to the nearby Cornwell Drain via an outlet tower. See Figure 1 - Existing Site Layout. Figure 2 - Decant Lagoon Blow Up.

Rec'd  
3/31/2014

The site was constructed in the late 1950s and was used on a permanent basis until the City entered into a contract to obtain treated water from the City of Detroit, at which time, the site was used occasionally for test runs as a redundant system. During this period, the City of Flint did not control fully site activities and some unauthorized discharges of illegal debris got placed within the site that has compromised the use of the site. As a result, The MDEQ has, on multiple occasions, requested that the City secure the site and insures that these activities are suspended while addressing the illegal disposal of street sweeping, concrete and asphalt debris within the site. See Figure 3.

## PROPOSED SYSTEM

The proposed upgrades associated with the Softening Residuals Disposal have been categorized into Phase II – Segment II and are to be completed as soon as practical so that the WTP can be utilized to treat water from the Flint River in the spring of 2014. However, the use of the Bray Road lagoon for other disposal activities will require that this issue be addressed independently to certain extent as to isolate the problem areas while working with MDEQ to permit its use for lime sludge disposal.

In order to analyze the issues, define the possibility of using the site and address MDEQ concerns, the LAN Team has performed additional survey, geotechnical and environmental testing at the site in order to assess the condition of the lime sludge in the basin and to verify the capacity of the lagoon system. Based on the preliminary findings of this evaluation, proposed improvements will be designed to accommodate the use of the facility in the interim basis (during the use of the Flint river) while addressing some of the MDEQ concerns about the site and any unauthorized discharges into the nearby stream. Permitting for site use will be incorporated as part of the overall design improvements at the WTP and submitted to the MDEQ for their pre-permit review and comments. A final package will be submitted to the MDEQ at the 100% design stage for permit issuance and approval of work plan.

The intended Work plan encompasses the following action items:

1. Evaluate the existing conditions in comparison to the original site design and its intended functionality in order to evaluate required design changes. Figures 1 & 2 highlight the original design and select key elements while Figure 3 shows the changes that may affect proper operation of the system.
2. Site survey of the project site has been completed. Collected data confirms the plan that the site has the required capacity to handle the continuous full time operation of the plant during the next 30 to 36 months until the KWA system is constructed and connection is made at which time, lime softening will not be required. Figure 4 highlights the current site features and proposed elevation for the required volume and anticipated 2 feet free board.



3. In order to address MDEQ concerns about discharges to the Cornwell Drain, the outlet tower will be capped to terminate any discharges to the stream while lime softening is in use at the WTP.
4. A separation barrier will be constructed to isolate the disposal area from the lime sludge discharge bay as shown in Figure 4.
5. A decant structure and submersible pump station will be constructed in the SE corner of the upper lagoon bay to treat and dispose of flows into the City's sanitary system. This system will be fully operational while the plant is treating river water and lime softening is required. A new storm treatment outlet structure may be reestablished with the approval of MDEQ after the KWA connection is online and lime softening is no longer in use.
6. In order to assess the potential impact of the disposal site on the ground water, two new monitoring wells were installed along the west side of the site in order to analyze the characteristics of the flow entering the site while using the existing monitoring wells to check whether these characteristics have worsened or not. Based on the results of the well data collected, it does not seem that the debris area is a cause for contamination to the site. However, The City will have to develop a more definitive environmental work plan to further evaluate and insure that the debris will not cause any detrimental effect on the groundwater system.

## PROPOSED MANAGEMENT PLAN

Drying and selling lime sludge for agricultural lime is a desirable solution to the disposal problem, since the money made by the sale offsets the disposal cost paid by the water treatment plant. If the lime sludge were not sold as a product, no value for the material could be recovered. However, The City of Flint has not had the time to research this option and find a suitable consumer(s) for such a transaction. But this option will be pursued and the plan will be modified for approval by the MDEQ when such option becomes viable.

Lime sludge could be disposed of in municipal solid waste (MSW) landfills. However, it is safe to assume that MSW landfills would prefer stockpiled lime sludge to be somewhat dry, because landfills need to minimize the amount of leachate they generate. Furthermore, if lime sludge were sent to a MSW landfill, the producer of the sludge may have to pay for the costs of drying, loading, and transporting the sludge, plus tipping fees.

Since the sludge may need to be retained in the lagoon for an average 10 -12 months before it is excavated from the dewatering lagoon with a backhoe and isolated to be dried in the sun during the summer in a month or two depending on air temperature, sun exposure, and humidity. Therefore The City of Flint is proposing the following approach to their lime sludge management plan:

1. The City is committed to removing all new lime sludge to be generated during the operation of the plant using Flint River water in addition to 10% of the lime sludge already in place at the site.



2. The equivalent of 10% of existing lime sludge and all future accumulations will be disposed of site either at the landfill or using approved land application sites.
3. Existing lime sludge on site will be manipulated and stored in two semi isolated bays along the north side of the lagoon in order to allow the City to start removing it from site for disposal at the landfill until land application sites are determined and approved by MDEQ.
4. The four available orifices, on site, will be utilized to discharge lime sludge into the lagoon system based on a quarterly or semi-annual rotating schedule as to allow for proper distribution of the lime sludge within the lagoon.
5. No flows will be permitted into the decant lagoon until the pump station is fully operational.

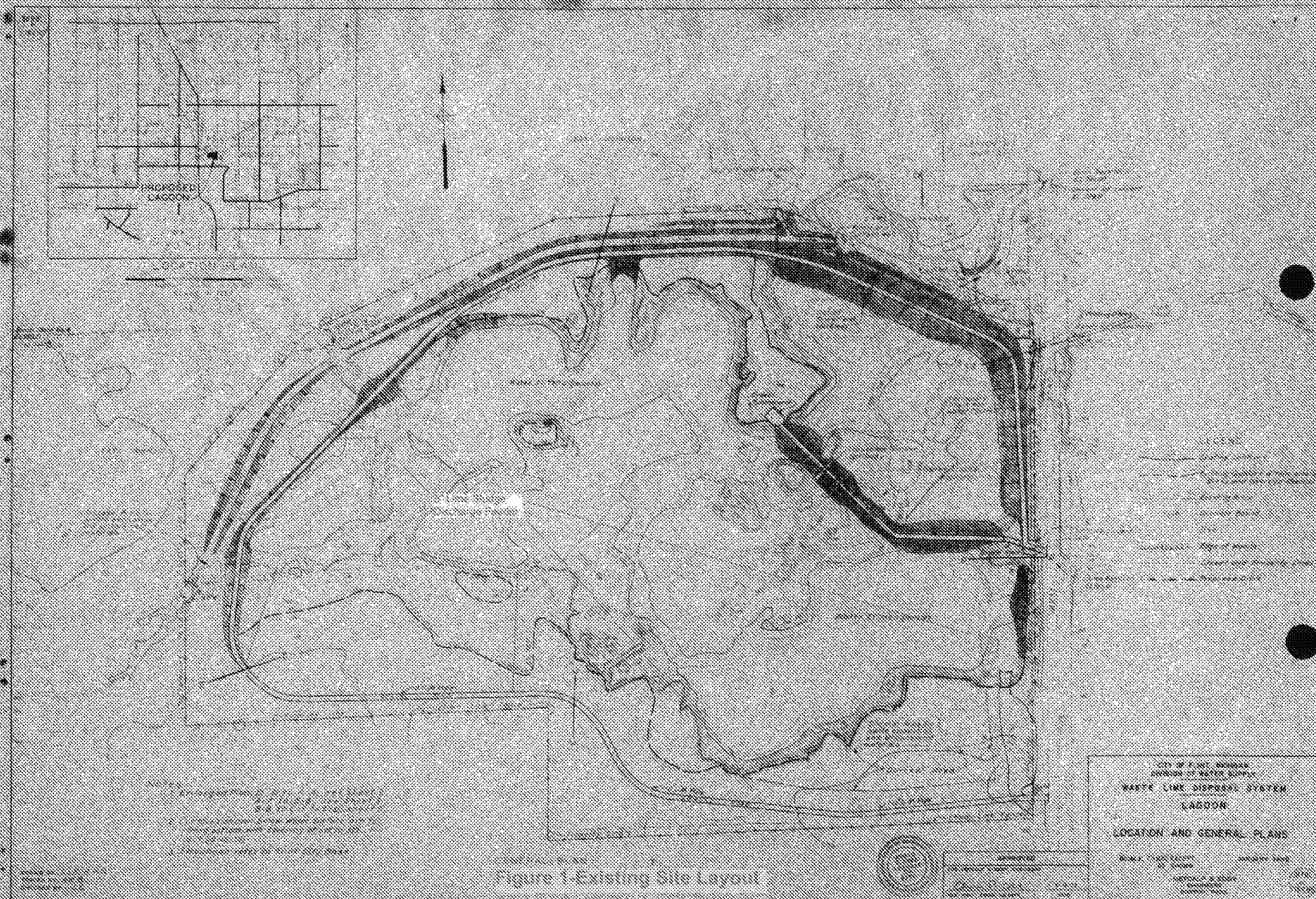
### 3. Implementation Schedule

The majority of the work associated with the operation of the WTP will need to be accomplished and completed by April 15, 2014 so the plant can be operational by April 17, 2014. All work associated with the Bray road site may not be complete but the following activities will be completed in order to allow for the successful operation of the Plant with MDEQ approval. The activities to be completed immediately are as follows:

1. Suitable Barrier to isolate the disposal area from the dewatering lagoon will be completed as agreed to with MDEQ.
2. Outlet Tower will be bulk headed out of the decant lagoon as to insure no outflow to the stream nearby (Cornwell Drain).
3. New orifice will be installed near the SE corner of the site to replace the two damaged that will be abandoned.
4. Stop logs will be in place to isolate the dewatering lagoon from the decant lagoon until the pump station is operational. *for installation*
6. Existing lime sludge will be manipulated along the edges as to excavate and store dry lime sludge in the upper two semi isolated bays for regular removal and disposal at the landfill until land application options are available for permitted use.

The City is committed to provide the appropriate improvements for the proper use of the site as a lime sludge disposal facility while addressing the issues associated with the unauthorized disposal areas so the site can be closed suitably and allow it to function as initially intended.











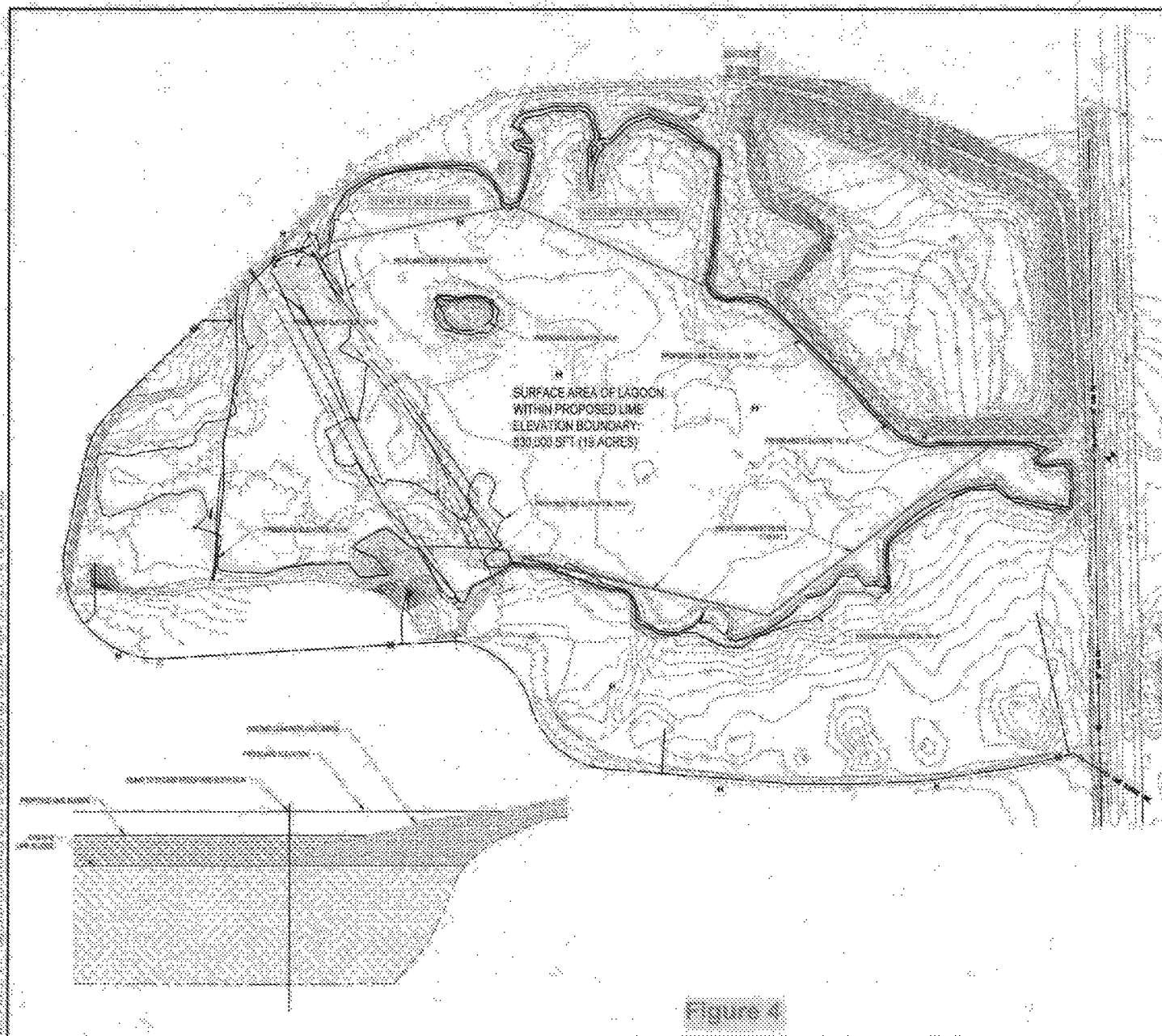
General Delta

Area of the original lagoon  
which got filled in with  
mud & coral

Figure 3

© 2013 Google

Google earth



Class: WTP  
Phase II, Segment II  
Topic: Seniors' Disease  
Date: 11/10/97



**len** 5.0000000, 2.0000000  
& 2.0000000, 1.0000000.



RALPH LAUREN  
POLO COMPANY

1982

8555

A blank sheet of graph paper with a grid pattern. The grid consists of horizontal and vertical lines forming small squares. There are approximately 10 columns and 8 rows visible. The lines are thin and black on a white background.

1998

100

1. ~~\_\_\_\_\_~~ \_\_\_\_\_

~~~~~



# Flint Operations Evaluation Update Mtg 11-7-2014

- completed & polymer quantity
- carbon use
- excess sludge
- sludge quantity
- Cl Break in Dist.
- Flushing
- Voluntary Issues
- pH adjusted
- ozone

## Wurfel, Brad (DEQ)

---

**From:** Wurfel, Brad (DEQ)  
**Sent:** Thursday, March 05, 2015 4:26 PM  
**To:** Hollins, Harvey (GOV); 'Wyant, Dan (WyantD@michigan.gov)'; Agen, Jarrod (GOV)  
**Cc:** Baird, Richard (GOV); 'Wurfel, Sara (GOV) (Wurfels@michigan.gov)'  
**Subject:** FW: Tap Filters

Harvey,

Since group call Tuesday I have been working out how the filter idea might take shape.

To reiterate some key points so we're all clear:

1. DEQ does not inspect individuals' homes in a situation like this. It's the city's system, their operators handle all complaints and maintenance. In fact, our folks alerted me that the city's got union rules in place forbidding any contractor from touching the system.
2. DEQ's role is limited to ensuring the plant is operating to state standards and the water it produces meets potability standards. The aesthetic issues drawing concern from residents — color, odor, taste — stem from a variety of things. Age of the system and prolonged lack of upkeep is the leading factor. But in some areas, another contributing factor is changes in water flow — source used to come from the south, now comes from the north, so some pipes are flowing in reverse, stirring up whatever was settled for a long time. In some sections, large pipes that historically served large communities are now serving a much smaller customer base, contributing to water stagnating in the system. In some areas, household connections are old and worn, so two neighbors may be having dramatically different experiences. My point is, the challenge takes many forms and there's no single solution that will bring sweeping change. The two consultants hired by the city have, as I understand it, both reinforced this idea in their assessments, so that's good.
3. The fix for this will be years in the making, truly. Even if full funding were available, 'big dig' projects can't all happen at once. The city needs to get an assessment of its infrastructure so it can prioritize its needs, and I understand they're working on that. In the near term, maintenance this spring / summer — things like cleaning the pipes in key sections and flushing the system via the hydrants — could offer some short term results. I know nobody wants to just wait for spring, but that is something important to keep in mind.
4. In the meantime, the group discussed possibly making home water filters available somehow. The National Safety Foundation is a Michigan company, headquartered and founded in Ann Arbor, that develops standards for all kinds of infrastructure. They're a globally recognized source for standard setting. A look at their site reveals there are myriad filtration options on the market and within each type (faucet mounted, whole house line filters, etc) there are filters that focus on different aspects of purification.

If this idea begins to get legs, I'd suggest testing some different models on the local water at the customer level to see if they work. I'd also suggest the idea be focused on tap-mounted models to promote clean, appealing drinking water. And I'd suggest this program could be funded in whole or in part by the state, but would need to be administered by the city (reinforcing the fact that they own, operate and service the system). I've got some information on filter models below.

Two more considerations: One, while the state has provided residents in some communities with bottled water in the past, it always has to do with their water being somehow contaminated -- as in, some kind of chemical plume that impaired local drinking water sources. This would be the first time the state took steps to deal with what is an aesthetic issue on a system where the water is meeting state drinking water standards.

#### Water filter info:

ANSI NSF Standard 42 Covers bacteriostasis, taste and odor (associated only with chlorine removal), and other aesthetic conditions

[http://standards.nsf.org/apps/group\\_public/download.php/19895/NSF\\_42-11a%20-%20watermarked.pdf](http://standards.nsf.org/apps/group_public/download.php/19895/NSF_42-11a%20-%20watermarked.pdf)

ANSI NSF Standard 53 Covers health effects removal

[http://standards.nsf.org/apps/group\\_public/download.php/19896/NSF\\_53-11a%20-%20watermarked.pdf](http://standards.nsf.org/apps/group_public/download.php/19896/NSF_53-11a%20-%20watermarked.pdf)

It is important to note that the filters are not required to meet all aspects of the standard, only the portions they want to make claims for. So product information for each filter must be reviewed to determine its applicability.

Most of these point of use filters are basic activated carbon filters that simply remove taste and odor specifically associated with chlorine, not other things like iron, manganese, hydrogen sulfide, etc. that can also impact taste and odor as well as color.

It is important to recognize that taste and odor is generally an individual preference and such standards have for the most part not been developed because groups of individuals may still consider taste and odor issues to exist even after levels for such a standard have been met.

Other considerations are that the test water for such filters attempting to meet the standard uses hardness levels of 170 mg/L or less. Flint's water at times may be above this level, which could then impact filter performance and longevity.

Most of these filters are designed to be replaced after 100 gallons or less of use, a period of about 3 months for most households. In addition the tests allow for initial pressure drops of up to 15 psi. This may limit use in households that already rely on minimum pressure within their household plumbing.

Regarding the health effects standards, as the Flint water system already meets such requirements, with the exception of the current TTHM locational running annual average, there is little point to the use of these filters for such a purpose.

To the point you'd asked about the other day, while Flint and Detroit are leading examples of unmaintained infrastructure, Flint is not alone by any means.

#### This recent infrastructure report card

<http://www.infrastructurereportcard.org/michigan/michigan-overview/>

Lists Michigan with a \$13.8 Billion need over the next 20 years.

<http://www.infrastructurereportcard.org/a/#p/state-facts/michigan>

#### Here's a link to the 2009 Report Card for Michigan Infrastructure

<http://www.michiganreportcard.com/>

From the report:

"A significant portion of the state's primary distribution system is nearing 100 years old. CWS are facing a significant challenge to maintain the vast network of aging, underground infrastructure. Within the city of Detroit alone, approximately 80% of its distribution piping was installed prior to 1940, which is not unusual for CWS in Michigan."

"The age of the majority of the state's distribution system is the primary contributor to normal decay and failure. In many cases, pipe life has far exceeded useful service life. Much of the older water systems consist of undersized mains constructed of materials such as unlined cast iron pipe. Minor fluctuations in system flows or pressure may cause red water complaints and even result in pipe failure. All CWS should have routine flushing and valve maintenance programs; however many are hesitant due to the time and cost."

"Under the Stage 2 Disinfection Byproducts Rule, all CWS that disinfect are required to provide increased trihalomethane (THM) and haloacetic acid (HAA5) monitoring due to the potential byproducts of chlorine reactions within the pipe system. Corrosion, scale, solid suspension on the interior sidewall of pipe, in addition to the age and condition of the system will require diligent rehabilitation investment to maintain system integrity."

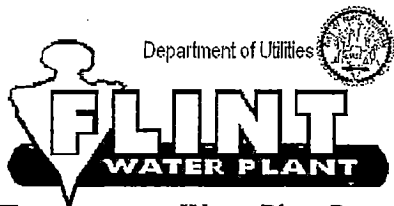
"While better materials and advanced technology is available to replace the aging distribution system, resources remain scarce when compared with the magnitude of the rehabilitation task at hand. Too often, distribution system replacement costs are underfunded and the first item to be slashed when budget problems arise. Overall, distribution system maintenance is reactionary in much of the older systems. Since the majority of the antiquated system will require removal and replacement beyond the CWS funding resources for systematic upgrade, a reactionary rehabilitation program is inevitable and must be funded accordingly."

Call or email me if you need anything further.

b

Brad Wurfel  
Communications Director  
Michigan Department of Environmental Quality  
517-284-6713

PPI cell



## Memorandum

**To:** Water Plant Personnel

**From:** Mike Glasgow  
Utilities Administrator

**Date:** October, 22 2015

**Subject:** Laboratory testing requirements for current water supply

Due to the recent change in water supply, the drinking water testing for the water plant laboratory personnel has been adjusted. The testing has been arranged to reflect what was conducted in years prior to operation of the treatment plant from the river. There are a few additional items that have been included, and this schedule may be adjusted as necessary.

### AM & PM PLANT RUN:

- Collect & analyze samples for chlorine residual and Coliform Bacteria in the morning and afternoon (at least 4 hours apart) from the following sites on plant grounds:  
Control Station # 2, Dort Well, Pump Station # 4, & Lab Tap

### LAB TAP TESTING:

- Collect & analyze lab tap samples once daily for pH, fluoride, total hardness, alkalinity, non-carbonate hardness, calcium, magnesium, total phosphate, temperature and chloride.
- Collect & analyze 3 samples daily (at least 3 hours apart) for Turbidity.
- Collect & analyze 1 sample weekly for Heterotrophic bacteria.

### DISTRIBUTION SAMPLING:

- Collect & analyze samples from the 10 distribution sites at least twice weekly for chlorine residual and coliform bacteria. A total of at 100 samples must be collected and analyzed each month, so in total, at least 10 sampling events should take place each month.
- Once weekly also test each distribution site for fluoride, total phosphate, and Heterotrophic bacteria.
- Once quarterly perform Water Quality Parameters (WQM) from the 25 distribution sites. Total phosphate will be a new addition to all the other parameters tested.
- Once quarterly collect Disinfection Byproduct samples (DBP) from 8 sites according to the current DBP schedule. Next sampling will take place the 3<sup>rd</sup> full week of November.
- Lead & copper sampling will be on going throughout the rest of the year, a detailed plan will be completed soon.

### RIVER SAMPLING:

- When time permits, a river sample should be collected once weekly and analyzed for coliform bacteria, pH, fluoride, total hardness, alkalinity, non-carbonate hardness, calcium, magnesium, temperature, turbidity, and chloride.

# Flint Compliance Options

## - Source Management

- DWSO
- Blending?
- Intake Draw pt.

## - Distribution BMP's

- Manage Water Age → Non critical
- Boring Distribution
- Flushing
- Leak Maintenance + Management

## - Pipe Rehab + Replacement

- pH adjustment ↓ increase Cl potency  
↳ good for Bacteria

## - Enhanced Coag

- Dose
- Chemical
- Mixing
- Oxidant
- Polymer

## Enhanced Softening

## GAC Filter Cap

## MT River Systems

- Am Arbor (Mixed)

- Blotfield

- Deerfield

- Adiron (Fountain) (Mixed)

- Alma (Mixed)

- Montisfigne



## Raw Water Users

- Large Ag
- DTE Greenwood? using DWSD Finished Water
- Withdrawal - 327 for lifetime authorization

## Verify Limitations on Ag Use

- Flint WTP is currently a backup  
Not up to full scale for standard use

## Detroit & Flint Contract Expired

## Revenue Survey

- 2/8 Mtg @ County  
10:00  
or 2/11



KWA

↳ Genesse Co. + Maybe Flint  
Lapeer Co.  
Sanilac Co.

DWSD → New Request to Flint  
Details Unknown  
Negotiations Ongoing

Cost Comparison DWSD vs. KWA  
10 yr analysis

IP County Flows Bonds for Flint

\$50-70 M → 1000 mgpd Transmission

Existing DWRF 10M in existing loans

- Co. 30M Bonded for Irtke

- AEC permit

Minor changes - Need Revised Permit

Bid Date 2/26

- Mfg w/ Co.

Wade Tron + AECum

LSP, Transmission, WTP, ASP

**City of Flint, Michigan**  
**Office of the City Administrator**

# Memo

**To:** Dayne Walling, Mayor

**From:** Natasha L. Henderson, City Administrator

**cc:** President Freeman and Councilmembers

**Date:** October 20, 2015

**Re:** Water Filtration Plant and Water Distribution Internal Review

---

## Water Filtration Plant and Water Distribution Systems Overview

The City of Flint's water filtration plant and distribution system have experienced many challenges over the past two years and it is of grave concern that we reflect upon the decisions that have been made and understand how we will proceed in the future. First, and foremost the City will conduct an internal review of the steps that were taken in 2013 when the agreement with Karegnondi Water Authority (KWA) was signed.

In the wake of recent water concerns, I have developed a proactive and comprehensive plan showing the City's commitment to deliver high quality water, address its aging infrastructure, and maintain a qualified staff. I am outlining a series of steps that the city will take to not only ensure that these goals are met but a plan that is designed to start rebuilding community trust through action and transparency.

In addition, with the assistance of the EPA Task Force, Michigan Department of Environmental Quality, and Safe Drinking Water Technical Advisory Committee, the following steps are meant to go into effect as quickly as possible with all goals being accomplished by the time KWA begins delivering raw water.

- Independent review
- Processes & Testing
- Training

- Technology
- Communication
- Lead Lines
- Capital Improvements

### **Independent Review**

We will seek to commission an independent source to review the technical and operational steps that occurred from the time the City signed on to the KWA to present. This is meant to internally perform an after action review in order to clearly assess the decisions that were made. My expectation is that we will hire out-side legal counsel to lead this internal review. I believe it is imperative that the City has all information that has led the City to the water quality issues that have arisen.

### **Internal Processes & Testing**

We understand that EPA standards are the minimum requirements that utility systems are required to meet, the City will establish and move forward with higher standards and goals than those set by regulators. As these new standards are set, they will be published with a plan on how to obtain each goal complete with expected timeframes. The following are the first set of goals that have been set by the City that exceed the regulatory requirements.

| <b>Regulatory Requirements</b>          | <b>City Goals</b>                       |
|-----------------------------------------|-----------------------------------------|
| (1) F-1 Licenced Personnel              | (2) F-1 Licenced Personnel              |
| (1) S-1 Licensed Personnel              | (2) S-1 Licensed Personnel              |
| 100 TTHM Samples per Month              | 120 TTHM Samples per Month              |
| 100 Lead/Copper Volunteer Samples / yr. | 300 Lead/Copper Volunteer Samples / yr. |
| Annual Water Quality Report             | Quarterly Water Report                  |

### **Training**

We will encourage all utility employees to become members of the American Water Works Association (AWWA) which is the largest nonprofit, scientific and educational association dedicated to managing and treating water. The AWWA offers continual training opportunities and the City will develop an internal training regimen that employees must adhere to. The goal is to continue to develop each employee which promotes a long term succession plan.

### **Technology**

The addition of enhanced Supervisory Control and Data Acquisition (SCADA) will make sure that the system is running with the industries most updated technology and running as efficient as possible. The SCADA adds automation to the Water Plant thereby reducing the need for as much manual intervention. The City will also maintain Safe Drinking Water Technical Advisory Committee with more consistent meetings.

### **Enhanced Communication**

We recognize that one of the key features of a Utility is the public communication with honest and candid information. We will increase the way we send information to people and the frequency that our communication is available. The following are first steps in that direction.

- Monitors around City Hall that display information about the water system

- Direct emails to individuals and neighborhood groups informing people where work is occurring
- Door hangers for field workers to distribute alerting people when water may be off or discolored
- A website page and GIS map dedicated to water events
- Quarterly Water reports that are directly mailed to users
- More frequent press releases that provide information relating to infrastructure concerns
- Immediate notification using all of the above media if a violation occurs
- An answering service so that every call is answered in a timely manor

### **Lead Service Lines**

Every effort will be made to ensure a program will be in place to address the long-term goal of replacing all lead service lines. The program is expected to address the location of all City owned lead service lines and look to provide an opportunity for homeowners to receive a grant in order to have their service line changed at the same time as the city is changing its lines. This coordinated program will look to utilize funds from multiple avenues to support City residents, such as:

- CDBG Funds
- DWRP revolving loan funding
- Grant funding

### **Capital Improvement Plan**

The City will continue to modify its 5-year CIP annually to make sure that we are always addressing the most critical issues facing the City. Another rate study will help set the correct rate for the system and determine the proper allocation to address concerns. The Water Reliability Study will continue to highlight the critical needs and will continue to be updated every two years.

**As City Administrator, my goal is to ensure all of the necessary steps are in place prior to the implementation of KWA delivering water to the City. All of these initiatives will be inserted into the Utilities strategic plan and tracked regularly by staff, myself, and reported to the DPW Committee to ensure accountability.**

city help

### Locations ID'd

- premise plumbing, makeup

- Risk Assessment

- Control Plan/Schedule

- Operational Records

Use OSHA Manual

### Proximate cause needed

La prover

Plumbing Code construction

only

- cooling towers

- evaporative condensers

- health care facilities

- hotels

- spa, hot tubs, pools

- fountains

- water heaters

- humidifier

- backpack sprayer

smoker prepositioning

### Flint WQ → Amplification

Biosan Laboratories, Inc.

Warren, MI

only MI ELITE CDC com

*Li pneumophila* (87%)

- Went over  
Epidemiology/

14 Done of 49 cases

- Goal → Find correlation

Finish  $\pm$  30 left

by End of May

- 1 case in March

- testing of risks of infection since it's equipment

- Illness not related to concentration



# Genesee County Health Department

Mark Valacak, M.P.H., Health Officer  
Gary K. Johnson, M.D., M.P.H., Medical Director

January 27, 2015

FOIA Coordinator, City of Flint  
1101 S. Saginaw Street, 3<sup>rd</sup> floor  
Flint, MI 48502

## **RE: Flint Water Plant Information Request**

Dear FOIA Coordinator,

Under provisions of the Michigan Freedom of Information Act (MCLA 15.231 et seq; MSA 4.1801 (1) et seq) please provide copies of the following:

Provide specific water testing locations and laboratory results within the City of Flint public water system for Coliform, E-coli, Heterotrophic Bacteria and Trihalomethanes from January 1, 2010 to January 27, 2015. Provide any additional water testing that has been conducted for identifying potential public health risks. Include any available mapping of the water testing areas.

Provide a map delineating the boundaries of the City of Flint water distribution system. Include any changes to the boundaries, along with corresponding dates from January 1, 2014 to January 27, 2015.

Provide a map or list of locations, detailing dead ends, pooling, low pressure and any additional areas of concern within the City of Flint water distribution system. Include any modifications to the water distribution system addressing concerns, along with corresponding dates from January 1, 2014 to January 27, 2015.

If you determine that any of the requested information is exempt from disclosure, please detail what is being withheld and cite the exemption under FOIA. I anticipate the request being filled within five working days of receipt of this letter, as provided under FOIA. Please contact me at (810) 257-3618 if there are fees associated to comply with this request.

Sincerely,

**Jim Henry**

Jim Henry  
Environmental Health Supervisor  
Genesee County Health Department  
630 S. Saginaw Street  
Flint, MI 48502

Better Life Through Better Health

Floyd J. McCree Courts & Human Services Building ♦ 630 S. Saginaw Street, Ste. 4 ♦ Flint, Michigan 48502-1540

Burton Branch ♦ G-3373 S. Saginaw Street ♦ Burton, Michigan 48529

Main Phone 810-257-3612 ♦ Visit us at: [www.gchd.us](http://www.gchd.us)

Historically, the Flint Water Treatment Plant utilized the Flint River as the source for providing drinking water to its customers. In 1967, the plant changed its source to the Detroit Water and Sewerage Department (DWSD). The DWSD water source is Lake Huron. The Flint River supply infrastructure to the water treatment plant was continuously maintained as a reserve source to the system.

Over time, the DWSD source became financially strenuous to the City of Flint (City) and in January 2006 discussions ensued regarding utilizing the Karegnondi Water Authority, which was not yet constructed, as the preliminary long-term water supply for Genesee County and the Flint Water Treatment Plant customers. In 2009, the Lake Huron water supply study for the Karegnondi Water Authority was conducted and an Executive Summary and Preliminary Engineering Report were generated. Due to the financial strains the City was experiencing, they resolved to end their contract with DWSD and convert the water supply back to the Flint River as the source for the Flint Water Treatment Plant prior to the completion of the Karegnondi Water Authority. In April 2014, after evaluation and testing of the treatment system with the Flint River source, the Michigan Department of Environmental Quality (MDEQ) issued the Flint Water Treatment Plant construction permits for full time operation enhancements. In May 2014, the conversion of the source was implemented and the Flint Water Treatment Plant began distributing water to its customers.

The MDEQ mandated two 6 month lead and copper monitoring periods beginning at the time of the implementation, the first of which required a report from the city on January 10, 2015. The results from this report indicated...

On March 30, 2015 the MDEQ notified the City of the lead and copper monitoring results. In April of 2015 corrosion control treatment plans are proposed by the City and examined by MDEQ in collaboration with the US Environmental Protection Agency (USEPA).

In May 2015, an investigation of a residential lead service line is conducted by the USEPA. Results indicated elevated water lead levels were caused by the lead leaching into the water from the service line. The second 6 month lead and copper monitoring period ended June 30, 2015. The City report provided indicated... On July 14, 2015 the MDEQ issued the City a construction permit for corrosion control measures.

On July 28, 2015 the MDEQ received information from Michigan Department of Health and Human Services (DMHHS) indicating blood lead levels in City of Flint residents were consistent with past years seasonal variations.

On August 17, 2015 MDEQ required the City to install corrosion control treatment. On September 24, 2015 Hurley Children's Hospital revealed data indicating elevated blood lead levels in children who reside in the City of Flint. This same date the DMHHS affirms that their data is more comprehensive than that of Hurley Children's Hospital. On September 25, the City of Flint announced a lead advisory regarding the drinking water to its citizens.

On October 1, 2015 the State Chief Medical Officer confirms Hurley Children's Hospital blood lead level data. On this same date the Genesee County Health Department issued the customers of the Flint Water Treatment Plant a "Do Not Drink" advisory. On October 15, 2015 the state legislature authorizes

\$9 million to assist the City to ~~for the~~ <sup>purchased treated water from</sup> return to DWSD and to fund staff to conduct investigations at City schools.

On October 16, 2015 the Flint Water Treatment Plant reverted its source back to DWSD <sup>to obtain water optimized for corrosion control based on the recognition of the City's</sup> due to the effects on the distribution system caused by the different characteristics of the Flint River water as compared to the Lake Huron source water. On October 28, 2015 the MDEQ issued a construction permit for additional corrosion control treatment. The MDEQ is supporting the response with incident management personnel, lead and copper water test kits and analysis and investigative teams. The connection to the Karegnondi Water Authority is scheduled to be completed in mid to late 2016.

Technical Advisory Committee

of DWSD purchased water and future corrosion control treatment of Karegnondi Water Authority water

to the City of Flint



---

**STATE OF MICHIGAN CONTRACT NO. 271N3200089**

**CITY OF FLINT WATER SUPPLY ASSESSMENT**  
**February 2013**

For Submittal to:  
**State of Michigan, Department of Treasury**



Submitted by:

**TY** TUCKER, YOUNG,  
**JT** JACKSON, TULL INC.

CONSULTING ENGINEERS-PLANNERS  
615 Griswold Suite 600  
Detroit, Michigan 48226  
(313)963-0612 FAX (313)963-2156

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## ***Appendices***

Appendices A – Meeting Minutes

Appendix B – Cost Worksheets

## **1. INTRODUCTION**

Tucker, Young, Jackson, Tull, Inc. (TYJT), at the request of the State Treasurer performed an analysis of the water supply options being considered by the City of Flint. The City of Flint is presently supplied potable water from the Detroit Water and Sewerage Department (DWSD). This supply is from a single 72-inch water main that terminates at a master meter located at Potter and Baxter. Additionally, downstream of the DWSD master meter, Flint supplies its customer Genesee County. The City of Flint also operates a water treatment plant that uses the Flint River as its source of supply to provide back up and redundancy to the DWSD supply as required by MDEQ.

The Karegnondi Water Authority (KWA) is planning on constructing a raw water supply system that could provide Lake Huron water to the Flint Water Treatment Plant. Flint's existing plant would be upgraded to treat the new raw water source.

*partially complete*  
The State Treasurer has appointed an emergency financial manager for the City of Flint. As such the Treasurer has requested TYJT to provide an analysis of the water supply options to assist the Treasurer in determining any potential risk and the best course going forward for supplying potable water to the City of Flint.

### **Report Organization**

The following sections of this report are described below:

Section 2 – The basis of the analysis is described in this section. The options include the KWA option and several options offered by DWSD.

Section 3 – A significant amount of information and data was collected including memorandums, reports, drawings, financial reports, and other documents. This section summarizes the information used in the analysis.

Section 4 – This section describes the evaluation of the cost of supply for the Flint options. The costs are comprised of the initial cost of operations plus the annual rate of escalation/inflation.

Section 5 – The evaluation process used to analyze the construction costs associated with the KWA supply system is described in this section. Additionally, the cost of financing the capital requirements is described.

Section 6 – This section presents the financial review of the options considered to supply potable water to Flint. A summary of these options is also provided.

## 2. FLINT WATER SUPPLY OPTIONS

Two water purveyor options were evaluated; the KWA water supply system and continued supply from DWSD. Both suppliers would provide water from Lake Huron as the source. The KWA system is a raw water supply, which means that the water would have to be treated by Flint before distributing the potable water to its customers. The DWSD supply is potable or "finished" water and would not need additional treatment.

Additionally, an option for the Flint WTP to supply the City of Flint without being supplied from either DWSD or KWA was initially considered. The preliminary investigation evaluated the cost associated with the required improvements to the plant and to the Flint River dam system. Although it appeared that this was a viable option, Flint in a meeting on December 20, 2012 with the Treasury, stated that the City did not want to pursue the option and it is no longer being considered. ✓

### *Some Improvements* **Karegnondi Water Authority (KWA) Lake Huron Water Supply**

The KWA water supply system schematic is shown in Figure 2-1. The system is comprised of an intake in Lake Huron that supplies water to the Lake Huron Pump Station (LHPS). The LHPS lifts the water and pumps it through an approximately 22 mile long 60-inch pipeline. The pipeline terminates at a 5 MG reservoir and is then pumped from the Intermediate Pump Station (IPS) through approximately 26 miles of 60-inch and 18 miles of 30-inch pipeline to the existing Flint WTP. Downstream of the IPS, approximately half way to the Flint WTP, the 60-inch line would also supply a new Genesee County WTP.

The raw water transmission system has a 60 MGD capacity and is sized to deliver a maximum of 18 MGD to the Flint WTP with an average day supply of 12 MGD. Improvements at the Flint WTP would also be required to treat the lake water as the plant is currently designed to treat the Flint River water.

The term of the KWA contract for Flint is 40 years.

↑  
25 MGD?

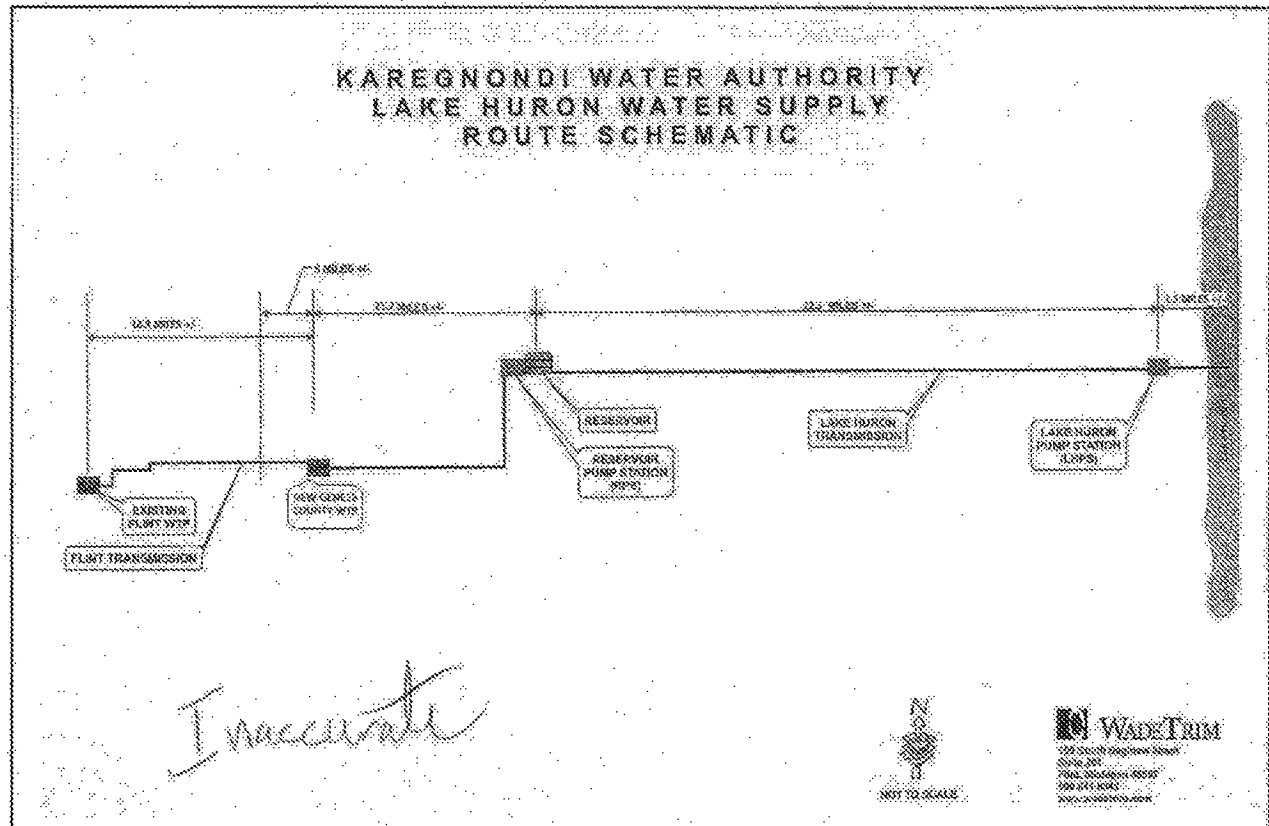


Figure 2-1: KWA Raw Water System

### DWSD Water System

The DWSD system schematic is shown in Figure 2-2. Flint is currently supplied by DWSD at Master Meter FL-1, located at Potter and Baxter. Flint typically gets its water from the Lake Huron WTP, located in Fort Gratiot, Michigan, near the Lake Huron shoreline. Water is treated and pumped at the Lake Huron WTP and supplied through a 120-inch pipeline to an intermediate pump station called the Imlay Pump Station. The Imlay Pump Station has 20 MG of reservoir capacity. Depending on the time of year and the DWSD system demand, water is either bypassed directly to Flint or it is re-pumped at Imlay. It should be noted that the DWSD supply to Flint is part of a very large water system and during emergencies or outages water can be supplied from the south up to Flint in lieu of the Lake Huron facility.

↑  
*then why would Flint WTP be required*

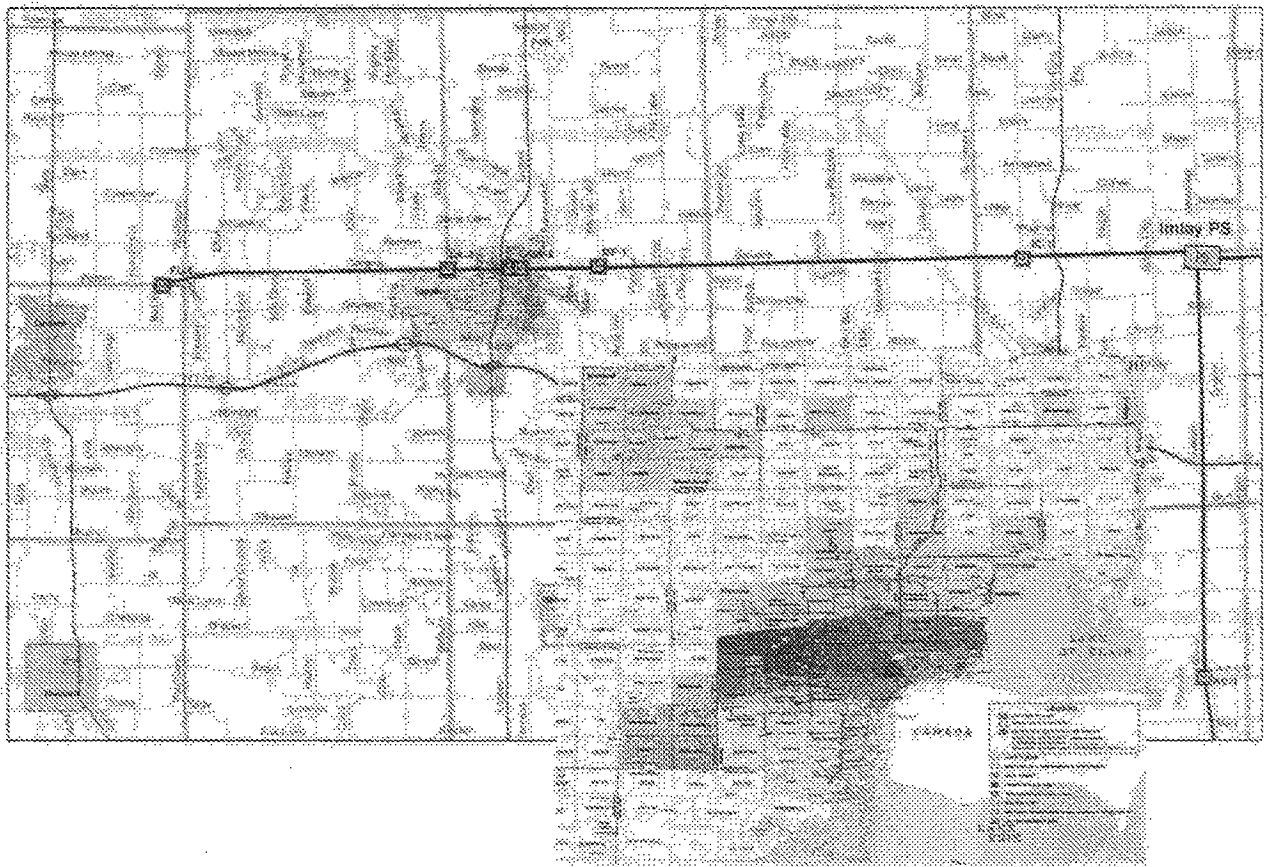


Figure 2-2: DWSD Water System

The pipeline from Imlay to FL-1 is a 72-inch pipeline. It has been estimated that the 72-inch line serving Flint has a capacity in excess of 90 MGD.

DWSD has presented several contractual options to Flint and all of them are based on Flint signing a new 30 year contract. The options shown in Table 2-1 are based on two different supply points; one at the current master meter location FL-1 at Potter and Baxter (P&B) and the other at the location of the Imlay Pump Station. The reason for the varying options is to provide a lower water rate at the Imlay Station, since the DWSD rate formula is based on distance and elevation factors related to the supply location.

The rates are also dependent on the maximum amount of water DWSD supplies. As example, if DWSD supplies a maximum day demand of 18 MGD that would equal the entire amount of water required by Flint.

For the options less than the maximum of 18 MGD means that the Flint WTP would supplement the difference by supplying water treated from the Flint River. These options are known as "blending" and would allow for Flint to blend two sources of water to supply its customers; the Flint River using the Flint WTP and Lake Huron from DWSD system.

*DWSD ~~has~~ not allow?*  
*will*  
*Startup Issues*

| Description                         | Average Day Demand |
|-------------------------------------|--------------------|
| 18 MGD Maximum Day Customer – FL-1  | 12 MGD             |
| 12 MGD Maximum Day Customer – FL-1  | 8 MGD              |
| 8 MGD Maximum Day Customer – FL-1   | 8 MGD              |
| 12 MGD Maximum Day Customer – Imlay | 12 MGD             |
| 8 MGD Maximum Day Customer – Imlay  | 8 MGD              |

**Table 2-1: DWSD Supply Options**



### 3. DATA COLLECTION

During the course of the investigation several documents were used to perform the analysis. The names of the documents are listed below for reference.

#### KWA and Flint

- Preliminary Engineering Report, Lake Huron Water Supply Karegnondi Water Authority, September 2009;
- Analysis of the Flint River as a Permanent Water Supply for the City of Flint, July 2011;
- Cost Comparison, KWA vs. DWSD, Letter to Mr. Kurtz, October 31, 2012;
- Lake Huron Supply Study, KWA, Appendix 20, October 2012 Preliminary Report Update, Final Report (DRAFT), October 4, 2012;
- Articles of Incorporation of Karegnondi Water Authority, endorsed in 2010;
- Karegnondi Water Authority Bylaws, October 26, 2010;
- KWA Raw Water Supply Contract;
- Flint WTP Statement of Revenues and Expenditures 09' – 12';
- GCDC Division of Water and Waste Services Financial Statements 03' – 11'; and
- Assorted emails with further clarification of questions and documentation.

#### DWSD

- Historical Rates and Charges to Flint 04' – 13';
- Historical Rates and Charges to Flint with Hypothetical Model Contract 10' – 13';
- 2013 Rates and Charges for the following options:
  - 18 MGD Maximum Day Customer at FL-1;
  - 12 MGD Maximum Day Customer at FL-1 (Flint blending\*);
  - 8 MGD Maximum Day Customer at FL-1 (Flint blending\*);
  - 12 MGD Maximum Day Customer at Imlay (Flint blending\*);
  - 8 MGD Maximum Day Customer at Imlay (Flint blending\*); and
- Assorted emails with further clarification of questions and documentation.

- \* Flint blending based on DWSD supplying two-thirds and Flint one-third of 12 MGD average day demand.

Two meetings were also held; one with DWSD and one with Flint and Genesee County representing KWA. The meetings were held on November 19, 2012 and November 20, 2012, respectively. Minutes from these meetings are included in Appendix A.

## 4. COST OF SERVICE

Information provided by DWSD, Flint, and representatives of the KWA were used in the cost of service evaluation. To evaluate the annual escalation/inflation rate over the planning period, the rate adjustment for DWSD was estimated based on the recent rate adjustment history. For the KWA system both the estimated cost of operations when the system begins supplying water and the annual rate adjustment or inflation was evaluated. The existing cost of operations and escalation for the Flint WTP was based on actual costs provided and then adjusted depending on the scenario considered. This section describes the evaluation process and the rates used in the analysis.

### DWSD Water Supply

The City of Flint has been a customer of DWSD since 1967. The Flint WTP has been maintained as a backup to the DWSD system. As indicated previously, several options were provided by DWSD depending on the type of service Flint was to select. The unit cost of water for each of these options is shown in Table 4-1. These rates are based on DWSD's FY13, which are current until July 2013.

| Option                              | Average Day Demand (MGD) | Unit Rate (\$/MG) |
|-------------------------------------|--------------------------|-------------------|
| 18 MGD Maximum Day Customer – FL-1  | 12                       | 16.37             |
| 12 MGD Maximum Day Customer – FL-1  | 8                        | 16.31             |
| 8 MGD Maximum Day Customer – FL-1   | 8                        | 12.68             |
| 12 MGD Maximum Day Customer - Imlay | 12                       | 14.38             |
| 8 MGD Maximum Day Customer - Imlay  | 12                       | 11.11             |

Table 4-1: Cost of DWSD Supply Options

To determine annual escalation rate, DWSD's last 10 years of history was used along with other large urban water systems in Michigan. The water systems used for benchmarking comparison were: Lansing, Grand Rapids, and Saginaw.

Table 4-2 identifies the annual and average rate of increase to Flint based on supplying water either to the current FL-1 at Potter and Baxter or Imlay. Note the last three years of the rates (FY 2011 through FY 2013) assumes that Flint's cost would be based on the new 30 year contract; FY 2011 being the first year that the new contract was available.

| Fiscal Year | Average Unit Cost (\$/MCF) | Annual Change (%) |
|-------------|----------------------------|-------------------|
| 2004        | 11.06                      |                   |
| 2005        | 10.24                      | -7.4              |
| 2006        | 10.56                      | 3.1               |
| 2007        | 11.09                      | 5.0               |
| 2008        | 11.35                      | 2.3               |
| 2009        | 13.07                      | 15.2              |
| 2010        | 11.73                      | -10.3             |
| 2011        | 13.89                      | 18.4              |
| 2012        | 15.08                      | 8.6               |
| 2013        | 16.24                      | 7.7               |
| Average     |                            | 4.4%              |

From FL-1

| Fiscal Year | Average Unit Cost (\$/MCF) | Annual Change (%) |
|-------------|----------------------------|-------------------|
| 2004        | 11.06                      |                   |
| 2005        | 10.24                      | -7.4              |
| 2006        | 10.56                      | 3.1               |
| 2007        | 11.09                      | 5.0               |
| 2008        | 11.35                      | 2.3               |
| 2009        | 13.07                      | 15.2              |
| 2010        | 11.16                      | -14.6             |
| 2011        | 12.23                      | 9.6               |
| 2012        | 13.28                      | 8.6               |
| 2013        | 14.32                      | 7.8               |
| Average     |                            | 2.9%              |

From Imlay

Table 4-2: Recent DWSD Water Rates

Audited financial reports were used to determine the rate of inflation associated with other three large municipal systems. The results are shown in Table 4-3.

| Water Systems | Years Evaluated | Average Rate (%) |
|---------------|-----------------|------------------|
| Lansing       | 05'-12'         | 4.6              |
| Grand Rapids  | 04'-11'         | 1.6              |
| Saginaw       | 04'-11'         | 7.0              |

**Table 4-3: O&M Inflation Rates of Other Large Water Systems**

Based on the information analyzed from DWSD and the other communities, it was determined that a fair annual rate of inflation for operations and maintenance cost for the analysis should be 4.4%. The 4.4% has historical significance from Flint's current water supplier and falls within the range of the other communities.

### ***KWA Water Supply***

The initial projected O&M cost for the KWA supply would be comprised of KWA's O&M costs as well as Flint's O&M costs. Because there was limited information provided, the initial estimated rate of \$1.50/MCF was used. This rate is based on information from the cost comparison analysis attached to the letter to Mr. Kurtz, dated October 31, 2012.

The KWA cost evaluation used an annual O&M inflation rate of 5%. To validate this rate a similar analysis to DWSD's operations and maintenance annual rate of inflation was used. First, in discussions with Flint and the Genesee County Drain Commission (GCDC), they believed that the annual rate of inflation for the new KWA system would be similar to the GCDC Water & Waste Services (WWS). Additionally, two large transmission systems were used to benchmark the inflation rates: the Southeastern Oakland County Water Authority (SOCWA) and the Ypsilanti Utility Community Authority (YUCA). Although both of these systems transmit finished water opposed to raw water, they were considered similar enough for comparison as they are comprised of only large water mains, pumping facilities and storage.

Once again audited financial statements were used to calculate the inflation rates. A summary of the findings are shown in Table 4-4. Based on the fact that the information analyzed showed a large difference between the two systems, it was determined that the KWA assumption of 5% was a good rate of inflation to use in the financial analysis. This rate is almost equally between the GCDC rate and the other two transmission systems.

| Systems  | Years Evaluated | Average Rate (%) |
|----------|-----------------|------------------|
| GCDG WWS | 03' - 11'       | 10.5             |
| SOCWA    | 04' - 12'       | —                |
| YUCA     | 04' - 12'       | 0.7              |

**Table 4-4: O&M Inflation Rates of Other Comparable Systems to KWA**

### ***Flint WTP***

The Flint WTP currently serves as a backup supply to the DWSD service to Flint. To maintain backup operations, the City of Flint operates the plant approximately 20 days each year. Flint indicated that the average production rate when they operate is 11 MGD.

For the blending options and the KWA supply considered, Flint would be required to operate its plant all year around. Therefore, their operating and maintenance costs were evaluated and adjusted to determine an annual cost associated with year-round operations.

The Flint WTP provided three years of operating costs for the assessment. Additionally, reports listed in Section 3 were also used as reference to determine both operating costs for the plant processing Flint River water (blending options) and Lake Huron raw water (KWA option).

Major cost centers were analyzed to estimate annual operation and maintenance. They included: labor, utilities, chemicals and residual management. In general, as recommended by the Flint plant staff, labor and overhead were increased from the current costs by two-thirds. Additionally, variable costs for power, chemicals and residual cost were increased to estimate full time treatment at the Flint WTP. Data from the KWA Preliminary Report and annual operating data for the Flint WTP (provided separately) were analyzed to make these forecasts.

The annual operating and maintenance costs developed for Flint WTP used are shown in Table 4-5.

| Source of Supply                 | Average Daily Production (MGD) | Estimated Annual O&M Cost |
|----------------------------------|--------------------------------|---------------------------|
| Flint River (Blending with DWSD) | 4                              | \$5,895,097               |
| Lake Huron (Supplied by KWA)     | 12                             | \$7,913,118               |

**Table 4-5: FY 13 O&M Costs for Year-round Operations**

It was determined that a fair annual rate of inflation for operations and maintenance cost for the Flint WTP plant should be 4.51%. The 4.51% is an average of Lansing, Grand Rapids and Saginaw facilities.

## 5. CAPITAL REQUIREMENTS

Large capital investments would be required by Flint and GCDC to construct the KWA supply system. Furthermore, some of the options presented by DWSD (supply point from Imlay) would require the purchase by Flint of DWSD's 72-inch water main. Performing the financial analysis; therefore, required an analysis of the KWA construction cost estimate for the transmission system and Flint WTP improvements.

Revenue bonds were also identified as the source of financing the new supply system and associated improvements. This section describes the assumptions made and the interest used for financing the improvements.

### KWA Supply System

The most current cost estimate of the KWA system was presented in the document titled; Lake Huron Supply Study, KWA, Appendix 20, October 2012 Preliminary Report Update, Final Report (DRAFT), October 4, 2012. The cost of construction is estimated at \$272,421,558. Flint's portion would be 30% or \$81,726,467.

Due to the significance of this expenditure, a detailed review of the cost was performed and is presented in this section. The analysis was performed based on the main elements of the supply system: the lake intake, the two pumping stations, and the transmission pipeline. Additionally, an analysis was performed related to construction contingencies and other costs such as engineering, legal, and administration.

### Lake Intake

KWA representatives indicated in a meeting in November that the design documents for the intake were at 90% and that it was planned for advertisement in January 2013. A summary of the estimate is shown in Table 5-1.

| Description     | Estimate     |
|-----------------|--------------|
| Intake and Crib | \$22,076,850 |
| ELAC at 25%     | 5,519,213    |
| Property        | 2,300,000    |
| Total           | \$29,896,063 |

Table 5-1: KWA Intake Cost Estimate

\$24.6M  
-\$5.3M

Based on the evaluation, it appeared that the cost estimate was reasonable. Given that the design was nearly complete, the engineering, legal, administration, and construction contingencies (ELAC) at 25% were also found to be appropriate.

## Pumping Stations

KWA representatives indicated that the pump stations were estimated at a level of design less than 15%. Therefore, in addition to an evaluation of their cost estimate, other water pumping station costs were used for comparison. Additionally, contractors were also contacted for costs. Table 5-2 summarizes the KWA cost estimate compared to our cost estimate performed for the Treasury.

| Description                                      | KWA | Estimate     | Unit | Estimate     |
|--------------------------------------------------|-----|--------------|------|--------------|
| Pumping Stations                                 |     | \$24,618,080 |      | \$54,573,314 |
| Land for Intermediate Pump Station and Reservoir |     | —            |      | 75,000       |
| Subtotal                                         |     | \$24,618,080 |      | \$54,648,314 |
| ELAC for Construction                            | 25% | 6,154,520    | 30%  | 16,394,494   |
| Total                                            |     | \$30,772,600 |      | \$71,042,808 |

Table 5-2: Pumping Stations Cost Estimate

Two things to note regarding the difference in the cost estimates; firstly, there is a large difference in the cost estimates of the pumping stations. The estimate developed for the Treasury used several other pumping stations construction costs from Southeastern Michigan and discussions with contractors. These costs were then computed on a \$/MG's for comparison. *what type →*

Secondly, our estimate for the Treasury is based on an ELAC of 30% instead of KWA's 25%. Although 25% was acceptable for the intake, it is believed to be too low for the pumping station estimate given that the engineering effort is less than 15%. *not good method as all sites have same basic structural costs*

## Transmission Main

Although the specific route for the transmission main was not provided, an estimate was calculated based on the general information provided. Once again, the KWA estimate was based on a level of design less than 15%. The estimate performed for the Treasury used the line items provided by KWA for the pipeline and also consulted with contractors to evaluate the cost of construction. The comparison is shown in Table 5-3.

Although the cost of construction of the pipeline is similar, a value of 30% was used for ELAC due to the level of design. Additionally, KWA did not believe there would be any additional costs for easements; however, this did not seem practical. Therefore an estimate for acquiring the easements was added to the Treasury estimate and is based on the 277 easements identified by KWA. The cost shown includes surveying, legal, engineering, administration, etc. *again on technical basis*



| Description           | TYIT | Estimate             | TYIT | Estimate             |
|-----------------------|------|----------------------|------|----------------------|
| Transmission Mains    |      | \$166,202,316        |      | \$167,419,530        |
| ELAC for Construction | 25%  | 41,550,579           | 30%  | 50,225,859           |
| Subtotal              |      | \$207,752,895        |      | \$217,645,389        |
| Easements             |      | --                   |      | 1,166,170            |
| <b>Total</b>          |      | <b>\$207,752,895</b> |      | <b>\$218,811,559</b> |

Table 5-3: Transmission Pipeline Cost Estimate

### Other KWA Costs

In prior estimates of the construction cost, KWA used an ELAC of 37%. In this case it could be considered that the engineering effort associated with the design would have been included. However, it is believed that KWA's reduced ELAC of 25%, does not include the design effort. Additionally, it would be prudent to assume that the owner would want a construction manager during construction of this large project. A summary of these costs are shown in Table 5-4.

| Description                                                             | Estimate            |
|-------------------------------------------------------------------------|---------------------|
| Design Engineering for Pumping Stations and the Transmission Pipeline   | \$16,939,581        |
| Construction Management at 5% of Project Cost Estimate of \$217,645,389 | 14,434,609          |
| Administration                                                          | 349,440             |
| Legal, Easements, Contract Documents                                    | 831,000             |
| <b>Total</b>                                                            | <b>\$32,554,630</b> |

Table 5-4: Other Costs

### Summary Comparison

A summary of the two cost estimates are shown in Table 5-5. Based on the comparison, the estimate performed by TYIT shows a higher cost to Flint by approximately \$25,000,000.

Note that there are two other costs shown in the summary that were not previously addressed; power and backup power. Regarding the cost of providing power to the pumping facilities, the cost of \$4,000,000 appears reasonable.

The KWA has repeatedly indicated that backup power is not needed. Backup power is a standard practice in the water industry. Furthermore, a loss of power at either pumping facility will prevent the supply of water to both Flint and Genesee County. For these reasons, the cost of providing backup power was included in our estimate for the Treasury.

*Not Required - Due to Reserve (Redundancy)*

| Item                                   | KWA Estimate          | Flint Estimate        |
|----------------------------------------|-----------------------|-----------------------|
| Intake/Crib                            | \$ 27,596,063         | \$ 27,596,063         |
| Pump Stations                          | 30,772,600            | 71,042,808            |
| Transmission Mains                     | 207,752,895           | 217,645,389           |
| Power                                  | 4,000,000             | 4,000,000             |
| Redundant Power for PS                 |                       | 1,273,200             |
| Land for Lake Huron Pumping Station    | 2,300,000             | 2,300,000             |
| Design Engineering/PS and Transmission |                       | 16,939,581            |
| Construction Management                |                       | 14,434,410            |
| Administration                         |                       | 349,440               |
| Legal/Easement/Contract Documents      |                       | 831,000               |
| Easements                              |                       | 1,166,170             |
| <b>Total</b>                           | <b>\$ 272,421,558</b> | <b>\$ 357,578,060</b> |
| <b>Flint Share at 30%</b>              | <b>\$81,726,467</b>   | <b>\$107,273,418</b>  |

Table 5-5: Total Cost Comparison

*\$25.5M*

### Flint WTP Improvements

The KWA analysis identified capital costs required to convert the existing WTP from river water treatment to treating lake water. The cost estimate was identified as \$7,100,000 in the 2009 report. This number was used in the our analysis, since additional information was not provided. For the purpose of the financial analysis; however, the \$7,100,000 was increased by 3% each year for three years to account for inflation.

*2.25% inflation 5yr Avg = .6 07  
not included 1.4 10  
3.8 11  
2.0% 12*

### DWSD Imlay Station Supply Options

The options identified by DWSD to supply service to Flint at the Imlay Pump Station would require Flint to purchase the 72-inch water main from Imlay to Master Meter, FL-1. The pipeline is approximately 25 miles long. The estimated cost provided by DWSD for estimating purposes is \$4,700,000.

*\$4.7/25 mile @ 72"*

*why does Flint pay?*

### Financing

The cost of financing the revenue bonds for the capital work was investigated. Based on conversations with local financial advisors knowledgeable in bond financing, an interest rate of 5% for the 25 year

$$\begin{aligned}
 & \$ 4,700,000 \div 132,000 = \$35.60/\text{fl} \\
 & \$ 132,000 = 25 \times 5280
 \end{aligned}$$

*< 5% current market*

period was considered acceptable. This is based on a Standard and Poor's bond rating of A without insurance.

Additional costs associated with the bond include the reserve and bond issuance fee. The bond holders will require a reserve of approximately 10% of the loan to be held for the 25 year payment period. The cost associated with the bond issuance has been estimated at 2.25% of the principal borrowed for the KWA project and 3% for the smaller loan associated with the Flint WTP improvements or the purchase of the 72-inch main.

Furthermore, since no revenue will be generated to pay on the bonds for the first three years that the system is being constructed, the cost associated with capitalizing the interest was also included.

Finally, interest on the reserve will be provided back to KWA and Flint. Although the interest is currently less than 1%, it was determined that a 3% rate would be more prudent long-term.

4 1/2%

## 6. FINDINGS

Using the information described in the previous sections, a cost evaluation was conducted for the KWA supply and the DWSD options. Individual worksheets for each option are provided in Appendix B. For the purpose of comparison a 30 year period was used. This period includes the 3 year construction period, the 25 loan period and an additional two years to get a sense of the cost of operation after the loans have been paid.

There were three separate cost sheets prepared for the KWA option. The first cost sheet (KWA) is based on the cost estimate provided by KWA. The costs provided assumed no overruns or delay in construction. With KWA's own assumptions of an overrun in construction of 15% and a one year delay in operations, the KWA estimated cost becomes \$686,375,920 through Year 2042.

Since this cost estimate did not appear to include the financing of revenue bonds, another cost sheet (KWA-1) was developed that included KWA's cost estimate without overruns with the additional finance costs associated with the revenue bonds. A final cost sheet (KWA-2) includes the cost associated with the revenue bonds based on the estimate provided by TYIT for the Treasury.

A summary of the cost sheets provided in Appendix B are shown in Table 6-1. Figure 6-1 shows the cumulative annual costs associated with each option.

| Option                                              | Cost through 2042 (\$) | Ranking by Cost |
|-----------------------------------------------------|------------------------|-----------------|
| DWSD 8 MGD Maximum Day at Imlay Station             | 634,795,488            | 1               |
| KWA (10/31/12 No Overruns, As Provided)*            | 649,775,166            | 2               |
| DWSD 8 MGD Maximum Day at FL-1                      | 672,671,705            | 3               |
| KWA-1 (10/31/12 No Overruns with Cost of Financing) | 707,279,715            | 4               |
| DWSD 12 MGD Maximum Day at Imlay Station            | 725,576,803            | 5               |
| DWSD 12 MGD Maximum Day at FL-1                     | 762,110,308            | 6               |
| KWA-2 (Treasury Estimate)                           | 766,784,313            | 7               |
| DWSD 18 MGD Maximum Day at FL-1                     | 821,226,268            | 8               |

\* \$686,375,920 with 15% overrun in construction and a one year delay in operations

Table 6-1: Total Cost of Options through 2042

Based on the analysis, it is prudent to assume the KWA water supply option costs would be somewhere between the KWA-1 and KWA-2 options. Therefore, the analysis indicates that the two DWSD options of supplying 8 MGD on a maximum day and up to 8 MGD on average are the least cost options for Flint. These options allow Flint to maximize the use of existing assets; the City of Flint's (the Flint WTP) and DWSD's (the existing 72-inch main).

Additionally, in recent conversations with the Treasury another option was discussed that could potentially be the most cost-effective solution. Currently the Flint WTP serves as a backup if service is

lost through either the DWSD or KWA pipeline. If the a twin pipe paralleling the DWSD 72-inch water main were constructed with interconnects with the 72-inch line, then the new water main could serve as the backup to Flint and the Flint WTP could be abandoned or potentially sold to Genesee County for their use.

The construction of the parallel pipeline would be considered in the DWSD capital expenditure as a Common to All (CTA) cost. This means that the capital cost of the pipeline would be shared by all DWSD customers and not just by Flint. Preliminary analysis of this option appears to be the most cost-effective of all the options discussed. However, a more thorough cost analysis is warranted and this approach would require an agreement between Flint and DWSD.

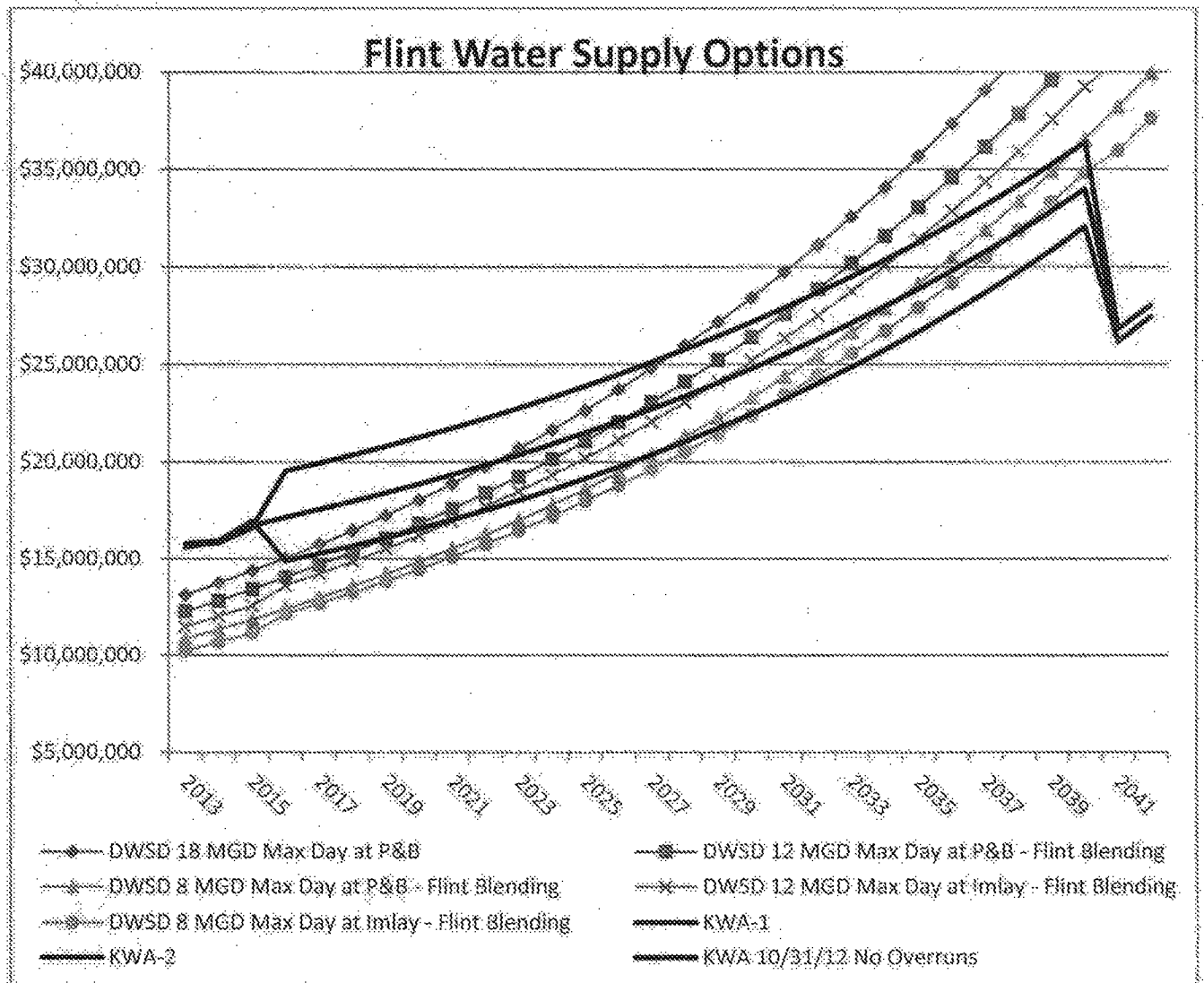


Figure 6-1: Flint Water Supply Options through 2042

## 7. OTHER CONSIDERATIONS

As part of the investigation other issues were identified that may result in risks to Flint that should be considered by the Treasury in determining how Flint's potable water should be supplied. These issues are related to redundancy and reliability, other items affecting cost, and Flint's desire to control its own destiny related to its water supply. These are described further below.

### Redundancy/Reliability

In one of the first meetings related to this task assessment, which was held on November 1, 2012, the Genesee County Drain Commissioner, Mr. Jeff Wright, stated that one of the main reasons for pursuing the KWA supply option related to the lack of reliability of the DWSD system. He pointed to the Northeast blackout of 2003; a widespread power outage that occurred throughout parts of the Northeastern and Midwestern United States and Ontario, Canada, on Thursday, August 14, 2003. He stated that Flint and Genesee County were out of water for several days.

It is worth noting that this was a power outage of historic proportions that affected millions of Americans. However, DWSD did begin supplying water again relatively quickly in comparison to other major cities impacted by the same power outage.

Furthermore, the KWA supply system offers less redundancy to Flint than the current DWSD system. Under both options, Flint is supplied by a single pipeline; however, DWSD has backup power at all of its major facilities supplying Flint. The KWA system will not have a redundant power at its pumping facilities. This would be a major risk.

*Not w/ Raw Reservoir*

Currently, backup to the DWSD system for Flint is Flint's WTP using the Flint River as the source of supply. KWA has stated that the Flint River source would also be used as backup to Flint if the KWA supply through its pipeline was lost. However, since the Flint WTP would be upgraded to treat Lake Huron water under the KWA option, using the Flint River as a backup source would require the Flint WTP to maintain two process treatment streams.

*Not True*

In addition to Flint and Genesee County, the DWSD's 72-inch main supplies Inlay City, Mayfield and the Greater Lapeer County Utilities Authority (GLCUA). The volume of water contained within the 72-inch main is approximately 30 MG. Only supplying these three remaining communities would cause the water age to increase dramatically; somewhere in excess of three weeks old, before reaching the customers' master meters. Since the half-life of chlorine in the DWSD system is approximately 5 days, the chlorine would most probably be near zero requiring re-chlorination of the finished water upstream of the master meters.

*2  
↓  
5  
↓  
1  
↓  
0.5  
↓  
1/2  
↓  
0.25  
↓  
0.12*

Re-chlorinating is a costly and risky process due to the instability of chlorine gas. It is unknown whether DWSD would pursue this improvement or possibly abandoned the 72-inch pipeline.

If Flint is supplied by the KWA system, then DWSD supplying their other customers along the 72-inch water main may be reconsidered. Since the KWA system is a raw water supply, the communities would

*Small Dia  
line  
pipe*

*Need  
to dig  
if pipeline  
at all*



either have to build a treatment facility to treat the water from KWA or find another water source for their communities.

### ***Additional Cost and Risk Considerations***

The design of the KWA supply and the construction of the system have not been completed; therefore, final costs and time to complete are unknown. Cost overruns and delays in completion will both negatively impact Flint's final cost. As example, if the project is not completed within the three year period, payment on the bonds will be due, but the revenue source needed from the sale of water could not be provided.

Furthermore, there is always a risk with large water system construction; especially those including an intake in the Great Lakes, pumping stations and rehabilitation of older water treatment plants. These risks include the potential of explosive gases in tunneling below Lake Huron, changing site conditions associated with the large number of miles of pipe installation and rehabilitating an older WTP, and the startup and debugging of the entire pumping system.

Flint has indicated that they have a high water loss. Not addressing this issue prior to sizing the Flint supply pipeline from KWA could cause the water main to be oversized along with its incremental cost in construction. *cost savings from Detroit put into dist. sys capital improvements*

Also, the KWA supply option appears to run counter to the Treasury's Competitive Grant Assistance Program (Formerly EVIP Grant). This program has been put in place to allow for communities to consolidate their services and save money. Two existing customers of DWSD (Flint and Genesee County) along with the potential of others customers (GLCUA, Mayfield, Imlay City) separating to from another water system is in contradiction to the program.

Finally, there is a concern over the ability of smaller systems (KWA) over larger systems (DWSD) to pay for future unfunded mandates and regulations. Obviously, identifying regulation requirements over 30 years is hard to determine. However, it is widely accepted that a large system has greater ability to respond to unfunded mandates because the cost can be distributed over a large customer base.

*Row vs. Franchised*

### ***Flint's Autonomy***

Flint has indicated that a major point of consideration is that they have no control over the rate increases issued to Flint by DWSD. All other counties supplied by DWSD have representatives on the Board of Water Commissioners (BOWC). The BOWC is one of the governing bodies that approve the water rates. Since Flint and Genesee County do not have a representative on the BOWC, Flint believes they are held "hostage" to DWSD's rates and cost of service.

This issue was stated in Flint's handout at the November 1, 2012 meeting. The handout is titled, "Flint Water Supply Future." However, it is worth noting in the same handout, Flint also identifies similar concerns with the governing board of the KWA system. Notably, that although Flint and Genesee County will be the only customers and Flint will be responsible for 30 percent of the construction cost,

they will have a minority vote on the KWA board. Furthermore, there are other communities (Lapeer County, the City of Lapeer, and Sanilac County) that sit on the board and vote. However, they are not purchasing water nor contributing to the construction costs.

Raw vs. Treated  
Issues

Plant expansion  
not as likely as GCDC  
distribution

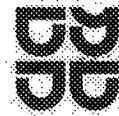


STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

State of Michigan, Department of Treasury

**Appendix A: Meeting Minutes**



TUCKER, YOUNG,  
JACKSON, TULL INC.

CONSULTING ENGINEERS-PLANNERS  
565 E. Larned Suite 300  
Detroit, Michigan 48226  
(313)963-0612 FAX (313)963-2156

## MEETING MINUTES

**IN ATTENDANCE:** Sue McCormick, DWSD Director  
Darryl Latimer, DWSD Deputy Director  
George Karmo, TYJT  
Awni Qaqish, TYJT  
Dave Guastella, TYJT

**DATE:** November 24, 2012

**PURPOSE OF MEETING:** Meeting with DWSD for the Indefinite-scope, Indefinite-delivery Contract Number 00383, 2012 Professional General Architectural/Engineering Services—City of Flint Water Supply Assessment

**PREPARED BY:** Dave Guastella

A meeting was held at the DWSD Main Office Building on November 19, 2012 to discuss the water supply options being presented by DWSD to the City of Flint. The main items discussed generally followed the attached DWSD Discussion/Questions that were provided to the Department prior to the meeting. A summary of the key points discussed are provided below.

### DISCUSSION ITEMS

- I. Question/Discussion Item: Verify that the four options presented at the November 1, 2012 meeting are still available for consideration:
  - a. Supplied from Potter & Baxter using the new model contract (assume a Maximum Day Customer).
  - b. Supplied from Imlay Station,
  - c. Finished un-pumped supply from Lake Huron WTP, and
  - d. Raw un-pumped supply from Lake Huron WTP.

*DWSD prefers to focus on the first two supply point listed; from the current location at Potter & Baxter and at the Imlay Pump Station as these apply specifically to Flint.*

*DWSD provided the attached summary regarding the current costs to Flint based on the various options that DWSD is offering. The savings associated with each option is provided as well. As example, if Flint were to purchase water from the supply point located at Imlay Station, the current cost to Flint would be \$5,661,000 and it would be a savings of nearly 50%.*

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

compared to Flint's current rate.

For How Long?

2. Question/Discussion Item: What additional capital improvements will be required for each option?

If Imloy Pump Station is selected as the supply point then Flint would need to purchase the 72-inch water main and an agreement to supply Lapeer would need to be worked out. DWSD believes that this could be worked out through a "wheeling" charge over the 72-inch main or possibly moving the supply point downstream of the Lapeer connection. DWSD estimates the value of the water main at \$4.7M. Flint could bond for this amount or DWSD could include the cost into Flint's rate.

What basis?

3. Question/Discussion Item: Are there other options being presented that should be considered (e.g., blending)?

Only the two options indicated above are currently being considered and both would include blending: DWSD providing 2/3 of the supply and the Flint WTP providing the other 1/3.

4. Question/Discussion Item: To evaluate each option over the 25 year planning period, provide:
- Annual water rate for Flint for 2002 through 2012, and the
  - Projected annual rate adjustment for each option. What are the proposed measures to keep the rate adjustments down in the future?

DWSD provided the attached historical rates from 2002 through 2012 for the existing water contract with Flint. The attachment also includes what the rates would have been if Flint had signed the new model contract or had taken service from Imloy. These rates were provided back to 2010.

DWSD believes that 5% would be a good estimation to assume for their annual escalation in rates over the 25 year planning period.

5. Question/Discussion Item: Flint stated a 10% increase in the capacity charge. What number did DWSD provide Flint?

It was unclear to DWSD where the 10% increase in capacity charge stated by Flint came from. DWSD's information provided shows an average of 6.3%. DWSD offered a meeting with TYJT to discuss how the fixed and commodity charges are allocated.

6. Question/Discussion Item: Flint financial comparison is based on the initial Cost of \$14,413,858, which includes \$2,725,538 for Flint WTP operating cost; i.e., DWSD charge is \$11,688,320. How good is this number?

DWSD indicated that the charge of \$11,638,320 is good through 6/30/13 based on their existing contract with DWSD.

7. Question/Discussion Item: KWA's initial charge to Flint is based on 12 MGD. Is DWSD charge

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

WTP costs?

---

based on 12 MGD?

Yes, 12 MGD from DWSD would be a maximum with Flint supplying 6 MGD for a total of 18 MGD (2/3 vs. 1/3).

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

**Indefinite-scope, Indefinite-delivery Contract Number 00383.  
2012 Professional General Architectural/Engineering Services**

**CITY OF FLINT WATER SUPPLY ASSESSMENT**

DWSD Discussion/Questions for the November 19, 2012 Meeting

1. Verify that the four options presented at the November 1, 2012 meeting are still available for consideration:
  - c. Supplied from Potter & Baxter using the new model contract (assume a Maximum Day Customer),
  - d. Supplied from Imlay Station,
  - e. Finished un-pumped supply from Lake Huron WTP, and
  - f. Raw un-pumped supply from Lake Huron WTP.
2. What additional capital improvements will be required for each option?
3. Are there other options being presented that should be considered (e.g., blending)?
4. To evaluate each option over the 25 year planning period, provide:
  - g. Annual water rate for Flint for 2002 through 2012, and the
  - h. Projected annual rate adjustment for each option. What are the proposed measures to keep the rate adjustments down in the future?
5. Flint stated a 10% increase in the capacity charge. What number did DWSD provide Flint?
6. Flint financial comparison is based on the initial Cost of \$14,413,858, which includes \$2,725,538 for Flint WTP operating cost, i.e DWSD charge is \$11,688,320. How good is this number?
7. KWA's initial charge to Flint is based on 12 MGD. Is DWSD charge based on 12 MGD?

Summary of DWSD Cost Allocations to Flint Under Various Scenarios

**Flint Only**

|                           | Revenue     | Rates and Charges |           |               |
|---------------------------|-------------|-------------------|-----------|---------------|
|                           | Requirement | Fixed             | Commodity | Avg Unit Cost |
| 1 Status Quo              | 11,461,700  | 357,271           | 12.46     | 19.91         |
| 2 Model Contract          | 9,732,100   | 275,517           | 11.16     | 16.90         |
| 3 Change                  | (1,729,600) | (81,754)          | (1.30)    | (3.00)        |
| 4 % Change                | -15.1%      | -22.9%            | -10.4%    | -15.1%        |
| 5 Max Day Only            | 9,424,700   | 271,010           | 10.72     | 16.37         |
| 6 Change                  | (307,400)   | (4,507)           | (0.44)    | (0.53)        |
| 7 % Change                | -3.3%       | -1.7%             | -4.1%     | -3.3%         |
| 8 Allow Blending          | 6,302,800   | 182,369           | 10.72     | 16.42         |
| 9 Change                  | (3,121,900) | (88,641)          | 0.00      | 0.05          |
| 10 % Change               | -49.5%      | -48.6%            | 0.0%      | 0.3%          |
| 11 Imlay City Connections | 5,800,700   | 170,912           | 9.77      | 15.11         |
| 12 Change                 | (502,100)   | (11,457)          | (0.95)    | (1.31)        |
| 13 % Change               | -8.7%       | -6.7%             | -9.7%     | -8.7%         |
| 14 Cumulative Change      | (5,661,000) | (186,359)         | (2.69)    | (4.80)        |
| 15 Cumulative %Change     | -49.4%      | -52.2%            | -21.6%    | -24.1%        |

|                          | Assumptions |            |            |              |             |            |
|--------------------------|-------------|------------|------------|--------------|-------------|------------|
|                          | Avg Day     | Max Day    | Peak Hour  | Distance     | Elevation   | Sales      |
|                          | <i>mgd</i>  | <i>mgd</i> | <i>mgd</i> | <i>miles</i> | <i>feet</i> | <i>mgd</i> |
| 1 Status Quo             | 11.8        | 21.6       | 22.6       | 52.0         | 866         | 11.8       |
| 2 Model Contract         | 11.8        | 17.9       | 18.8       | 52.0         | 866         | 11.8       |
| 3 Max Day Only           | 11.8        | 17.9       | 17.9       | 52.0         | 866         | 11.8       |
| 4 Allow Blending         | 7.9         | 11.9       | 11.9       | 52.0         | 866         | 7.9        |
| 5 Imlay City Connections | 7.9         | 11.9       | 11.9       | 45.2         | 866         | 7.9        |

## Recent DWSD Water Rates to Flint

| FY                                 | Rates and Charges |                     |                         | Annual Change  |                     |                         | Average       |
|------------------------------------|-------------------|---------------------|-------------------------|----------------|---------------------|-------------------------|---------------|
|                                    | Fixed<br>\$/mo    | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Fixed<br>\$/mo | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Annual Change |
| <i>As Charged</i>                  |                   |                     |                         |                |                     |                         |               |
| 2004                               |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005                               |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006                               |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007                               |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008                               |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009                               |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010                               |                   | 14.32               | 14.32                   |                |                     | 9.6%                    |               |
| 2011                               | 182,301           | 14.29               | 16.01                   |                | -0.2%               | 11.8%                   |               |
| 2012                               | 443,096           | 13.36               | 17.53                   | 143.1%         | -6.5%               | 9.5%                    |               |
| 2013                               | 707,000           | 12.46               | 19.12                   | 59.6%          | -6.7%               | 9.1%                    | 6.3%          |
| <i>Hypothetical Model Contract</i> |                   |                     |                         |                |                     |                         |               |
| 2004                               |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005                               |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006                               |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007                               |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008                               |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009                               |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010                               |                   | 13.96               | 13.96                   |                |                     | 6.8%                    |               |
| 2011                               | 145,918           | 13.74               | 15.28                   |                | -1.6%               | 9.5%                    |               |
| 2012                               | 378,968           | 12.58               | 16.57                   | 159.7%         | -8.4%               | 8.4%                    |               |
| 2013                               | 597,323           | 11.63               | 17.93                   | 57.6%          | -7.6%               | 8.2%                    | 5.5%          |

TFG

## Recent DWSD Water Rates to Flint

| FY                                              | Rates and Charges |                     |                         | Annual Change  |                     |                         | Average       |
|-------------------------------------------------|-------------------|---------------------|-------------------------|----------------|---------------------|-------------------------|---------------|
|                                                 | Fixed<br>\$/mo    | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Fixed<br>\$/mo | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Annual Change |
| <i>As Charged</i>                               |                   |                     |                         |                |                     |                         |               |
| 2004                                            |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005                                            |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006                                            |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007                                            |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008                                            |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009                                            |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010                                            |                   | 14.32               | 14.32                   |                |                     | 9.6%                    |               |
| 2011                                            | 182,301           | 14.29               | 16.01                   |                | -0.2%               | 11.8%                   |               |
| 2012                                            | 443,096           | 13.36               | 17.53                   | 143.1%         | -6.5%               | 9.5%                    |               |
| 2013                                            | 707,000           | 12.46               | 19.12                   | 59.6%          | -6.7%               | 9.1%                    | 6.3%          |
| <i>Hypothetical Model Contract - Flint Only</i> |                   |                     |                         |                |                     |                         |               |
| 2004                                            |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005                                            |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006                                            |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007                                            |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008                                            |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009                                            |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010                                            |                   | 11.73               | 11.73                   |                |                     | -10.3%                  |               |
| 2011                                            | 70,060            | 12.45               | 13.89                   |                | 6.1%                | 18.4%                   |               |
| 2012                                            | 175,882           | 11.47               | 15.08                   | 151.0%         | -7.9%               | 8.6%                    |               |
| 2013                                            | 272,923           | 10.65               | 16.24                   | 55.2%          | -7.1%               | 7.7%                    | 4.4%          |



# Recent DWSD Water Rates to Flint

| FY                | Rates and Charges |                     |                         | Annual Change  |                     |                         | Average       |
|-------------------|-------------------|---------------------|-------------------------|----------------|---------------------|-------------------------|---------------|
|                   | Fixed<br>\$/mo    | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Fixed<br>\$/mo | Commodity<br>\$/Mcf | Avg Unit Cost<br>\$/Mcf | Annual Change |
| <i>As Charged</i> |                   |                     |                         |                |                     |                         |               |
| 2004              |                   | 11.06               | 11.06                   |                |                     |                         |               |
| 2005              |                   | 10.24               | 10.24                   |                |                     | -7.4%                   |               |
| 2006              |                   | 10.56               | 10.56                   |                |                     | 3.1%                    |               |
| 2007              |                   | 11.09               | 11.09                   |                |                     | 5.0%                    |               |
| 2008              |                   | 11.35               | 11.35                   |                |                     | 2.3%                    |               |
| 2009              |                   | 13.07               | 13.07                   |                |                     | 15.2%                   |               |
| 2010              |                   | 14.32               | 14.32                   |                |                     | 9.6%                    |               |
| 2011              | 182,301           | 14.29               | 16.01                   |                | -0.2%               | 11.8%                   |               |
| 2012              | 443,096           | 13.36               | 17.53                   | 143.1%         | -6.5%               | 9.5%                    |               |
| 2013              | 707,000           | 12.46               | 19.12                   | 59.6%          | -6.7%               | 9.1%                    | <b>6.3%</b>   |

## *Hypothetical Model Contract - Flint Only @ Imlay*

|      |         |                  |                  |        |       |        |             |
|------|---------|------------------|------------------|--------|-------|--------|-------------|
| 2004 |         | 11.06            | 11.06            |        |       |        |             |
| 2005 |         | 10.24            | 10.24            |        |       | -7.4%  |             |
| 2006 |         | 10.56            | 10.56            |        |       | 3.1%   |             |
| 2007 |         | 11.09            | 11.09            |        |       | 5.0%   |             |
| 2008 |         | 11.35            | 11.35            |        |       | 2.3%   |             |
| 2009 |         | 13.07            | 13.07            |        |       | 15.2%  |             |
| 2010 |         | <del>11.16</del> | <del>11.16</del> |        |       | -14.6% |             |
| 2011 | 65,919  | <del>10.88</del> | <del>12.23</del> |        | -2.5% | 9.6%   |             |
| 2012 | 165,275 | 9.89             | 13.28            | 150.7% | -9.1% | 8.6%   |             |
| 2013 | 255,580 | 9.09             | 14.32            | 54.6%  | -8.1% | 7.8%   | <b>2.9%</b> |

TFG

## MEETING MINUTES

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**IN ATTENDANCE:** Ed Kurtz; Flint Emergency Financial Manager, City of Flint  
Dayne Walling; Mayor, City of Flint  
Mike Brown, City of Flint  
John O'Brien, Genesee County  
Howard Croft, City of Flint  
Dwayne "Duffy" Johnson, City of Flint  
Brent Wright, City of Flint  
Awni Qaqish, TYJT  
Dave Guastella, TYJT

**DATE:** November 24, 2012

**PURPOSE OF MEETING:** Meeting with the City of Flint for the indefinite-scope, indefinite-delivery Contract Number 00383, 2012 Professional General Architectural/Engineering Services – City of Flint Water Supply Assessment

**PREPARED BY:** Dave Guastella

A meeting was held at the City of Flint Municipal Center on November 20, 2012 to discuss the water supply option being presented by the Karegnondi Water Authority (KWA) to the City of Flint. The main items discussed generally followed the attached KWA Discussion/Questions that were provided to City prior to the meeting. A summary of the key points discussed are provided below.

The questions submitted are repeated in the Discussion Items for easy reference. A summary of the action items generated from the meeting follow the Discussion Items.

### DISCUSSION ITEMS

1. Question/Discussion Item: Is the maximum day demand of 18 MGD for Flint the maximum day demand (MDD) throughout the 25 year planning period? If not, what is the 25 year projected MDD?

*KWA would supply up to 18 MGD. 18 MGD has been assumed as the maximum day demand and 12 MGD is assumed as the average day demand throughout the 25 year planning period.*

2. Question/Discussion Item: Copy of the intake contract documents and engineer's estimate.

The intake contract documents are approximately 90% complete and are not available for distribution. However, the updated Appendix 20, dated October 4, 2012 includes the most recent cost estimate of the intake based on the current design in process.

Comments: Meeting minutes were recorded based on the understanding of the author. Please contact the author within three days if you have any different understanding of the meeting. These minutes will be considered approved unless comments are provided within three days.

3. Question/Discussion Item: Documentation of the Flint WTP improvements required and cost estimate.

The costs are approximately \$7M as presented in the September 2009 Preliminary Engineering Report. However, this estimate has been updated. Some processes have been eliminated. John O'Brien will provide the updated costs and the description of the planned improvements to the plant.

not in Feb Report

4. Question/Discussion Item: Confirm Flint's allocated percentage of the KWA capital improvements (30%?).

Yes, the allocation is based on 18 MGD/60 MGD total capacity.

$18/60 = 30\%$

$60 - 18 = 42 \text{ MGD}$

5. Question/Discussion Item: Copy of the proposed KWA operating agreement for Flint.

John O'Brien will provide the operating agreement as well as the Capacity Contract and Articles of Incorporation.

6. Question/Discussion Item: What is the annual operating agreement adjustment projected for the 25 year planning period?

This information is provided in Appendix 14, Table 14.2 of the September 2009 Preliminary Engineering Report. Operating cost based on Table 1. Used 12 MGD as average day demand (ADD). Assumed 5% as the annual increase in operating costs. John O'Brien indicated that these operating costs were based on Genesee County's operating costs. John O'Brien will provide the last 10 years of audited financial statements for the water fund.

To assess operating and maintenance costs for the Flint WTP, Duffy will provide multiple years of financial statements for the water fund. Duffy did not believe they had 10 years, but they will provide what they have.

Regarding operation and maintenance costs, Flint believes that these costs will increase by 2/3 of what they are now.

7. Question/Discussion Item: Need the route of the pipelines and the locations of the facilities proposed. Purpose is to identify constraints that impact costs (i.e., utilities, environmental (e.g. wetlands), easements, etc.).

KWA will not release the route due to concerns regarding speculation of land and easements. John O'Brien did indicate that the Lake Huron pump station would be at Fisher and M-25. The intermediate pump station site is near a location of the Lapeer/Sanilac/St. Clair border; where all three meet.

8. Question/Discussion Item: KWA's initial charge to Flint is based on a 12 MGD average day demand. What is the basis of this number? Are there population projections and water use figures available that were used to determine the Flint demand for the 25 year planning period?

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This was answered in Question No. 1 above.

No See Flint SS & RS

9. Question/Discussion Item: Is there a transition plan and cost during construction of the KWA system identified?

*Flint is looking for an agreement with DWSD for back-up supply from the 72-inch main at the Genesee border.*

10. Question/Discussion Item: The October 4, 2012 Preliminary Engineering Report Update states: "no backup power is planned for the pumps" (LHPS) and "No backup power is planned for pumping" (IPS). In case of power loss, how would Flint supply its customers?

*Flint indicated that they have adequate storage to supply the system for 6 to 7 days. Flint has 55 MG of storage and Genesee County has 65 MG for 2.5 days.*

11. Question/Discussion Item: The latest plan shows only a 5 million gallon ground reservoir is planned for balancing between LHPS and IPS. How is redundancy maintained?

*In cases of emergency, Flint indicated that the back-up for the KWA system will be the same as it is now with DWSD; they will use the Flint River as the source water. Flint currently operates their plant four times a year.*

*When questioned as to whether the WTP will be able to treat both lake water from the KWA system and river water Flint indicated that once the improvements identified in the September 2009 Preliminary Engineering Report are completed they will be able to accomplish both treatment processes. Flint will provide a schematic of the treatment trains at the WTP and a copy of the Flint transmission system.*

*Genesee County indicated that additional redundancy would also be provided from the new Genesee County WTP.*

*Regarding hydraulic transients; Genesee County indicated that a model analysis has not been included, but capital costs for mitigating transients have been included.*

12. Question/Discussion Item: Related to the construction cost:

- a. Does it include an additional traffic lane since the construction will occupy half the right of way? *Not required, all roads are county roads; however, there are a few State road crossings.*
- b. Does it include costs/fees for permit requirements such as inspection cost by the jurisdictional authorities? As a point of reference, the permit fee costs for the Flint Transmission System came out to be \$5.8 million. *Not required; all of the counties have waived any fees.*
- c. Does the cost of the steel pipe segments include corrosion protection measures such as:

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anode stations and related O&M? Yes; however, the KWA has not settled on using steel pipe. PCCP pipe may be used. Steel shown in estimate because it is highest in cost and therefore the pricing is conservative.

d. SCADA monitoring stations require power. Is the cost of bring power to the SCADA stations included? Again, as a point of reference for the Flint Transmission System we estimated \$800,000 for power to SCADA and valve operators. Yes, Genesee County did emphasize that the SCADA system will be simple and straightforward because a lot of controls are not required.

e. Other items discussed at the meeting included:

- The 2009 plant improvement cost is still good; however, there will be some reduction, such as a sulfuric chloride feed system that was eliminated. Plant capacity now is 36MGD, but will be 18 MGD.
- The KWA Lake Huron Pumping Station (LHPS) is now only high lift pump station.
- Genesee County will provide the distance of the intake pipe from the crib to the LHPS.
- The intake project is almost ready to bid; waiting for the COE permit.
- Genesee County is estimating the construction for the pipe lines and pump stations will begin July 2013.
- The route has been flown for survey.
- Genesee County is estimating construction will be complete and the project will be placed in service by Jan 2016.
- Genesee County to provide a list of assumptions that the \$272 million cost estimate is based on since the route is now known.

13. The Flint River is identified as a backup: At what capacity? MDD or emergency supply?

*The Flint River would serve as a back up supply.*

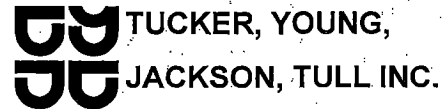
14. Where did the 40 years come from (Flint hostage to Detroit)? DWSD's new contracts are 30 years with openers to revise terms of supply (volume and pressure) after the first two years, then three years, and then in five year increments thereafter.

*The 40 years was stated in error. The reference was to DWSD's requirement to sign a 30 year contract.*

*After 40 years Flint will own 30% of the project and can sell their share of ownership if they want. Conversely, with DWSD, they continue to pay for the capital projects but have no ownership. Flint believes they will know what they will be charged for the next 25 years versus DWSD that can't commit to a fixed escalation.*

| Action Items for Follow-up                                                                                      |               |                  |
|-----------------------------------------------------------------------------------------------------------------|---------------|------------------|
| Items:                                                                                                          | Assigned To:  | Date to Complete |
| 1. Updated Costs for the Flint WTP Improvements and a description of the improvements.                          | John O'Brien  | 11/21/12         |
| 2. KWA Operating Agreement, Capacity Contract and Articles of Incorporation.                                    | John O'Brien  | 11/20/12         |
| 3. Provide the last 10 years of audited financial statements for the Genesee water fund.                        | John O'Brien  | 11/20/12         |
| 4. Provide multiple years of financial statements for the City of Flint water fund.                             | Duffy Johnson | 11/26/12         |
| 5. Provide schematic of the Flint WTP and a map of the Flint transmission system.                               | Brent Wright  | 11/26/12         |
| 6. Provide the length of the intake pipe from the crib to the pump station.                                     | John O'Brien  | 11/20/12         |
| 7. Provide a list of assumptions that the \$272 million cost estimate is based on since the route is now known. | John O'Brien  | 11/26/12         |

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TUCKER, YOUNG,  
JACKSON, TULL INC.  
CONSULTING ENGINEERS-PLANNERS  
565 E. Larned Suite 300  
Detroit, Michigan 48226  
(313)963-0612 FAX (313)963-2156

**Indefinite-scope, Indefinite-delivery Contract Number 00383  
2012 Professional General Architectural/Engineering Services**

**CITY OF FLINT WATER SUPPLY ASSESSMENT**

**KWA Discussion/Questions for the November 20, 2012 Meeting**

1. Is the maximum day demand of 18 MGD for Flint the maximum day demand (MDD) throughout the 25 year planning period? If not, what is the 25 year projected MDD?
2. Copy of the intake contract documents and engineer's estimate.
3. Documentation of the Flint WTP improvements required and cost estimate.
4. Confirm Flint's allocated percentage of the KWA capital improvements (30%?).
5. Copy of the proposed KWA operating agreement for Flint.
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11. The latest plan shows only a 5 million gallon ground reservoir is planned for balancing between LHPS and IPS. How is redundancy maintained?
12. Related to the construction cost:
  - a. Does it include an additional traffic lane since the construction will occupy half the right of way?
  - b. Does it include costs/fees for permit requirements such as inspection cost by the jurisdictional authorities? As a point of reference, the permit fee costs for the Flint Transmission System came out to be \$5.8 million.

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- 
- c. Does the cost of the steel pipe segments include corrosion protection measures such as anode stations and related O&M?
  - d. SCADA monitoring stations require power. Is the cost of bring power to the SCADA stations included? Again, as a point of reference the for the Flint Transmission System we estimated \$800,000 for power to SCADA and valve operators.
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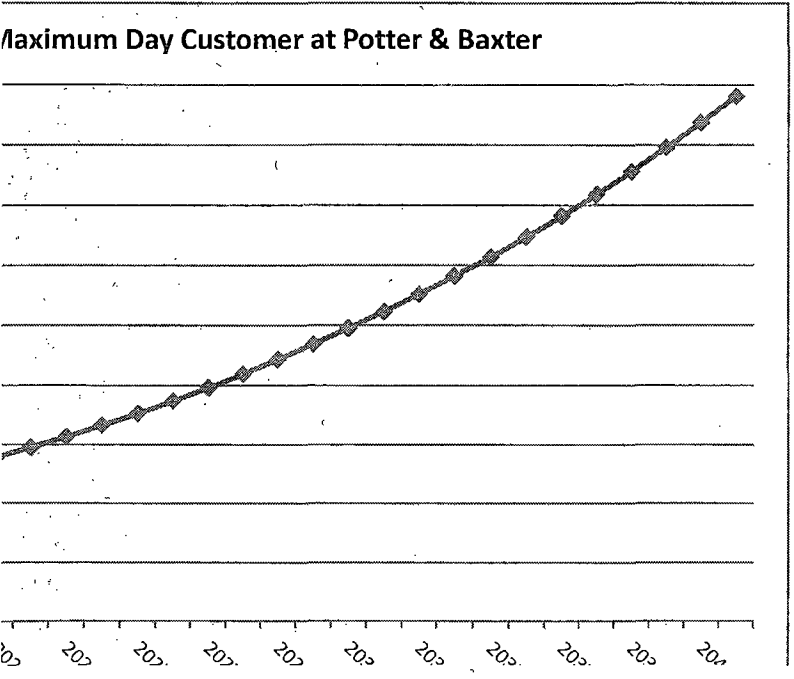
STATE OF MICHIGAN CONTRACT NO. 271N3200089

CITY OF FLINT WATER SUPPLY ASSESSMENT

State of Michigan, Department of Treasury

**Appendix B: Cost Worksheets**

0.60 MGD                      81 MCF/Day  
 12 MGD                      1,604 MCF/Day  
  
 29,412 MCF  
 585,561 MCF  
  
 120.30 /MCF    \$ 3,538,214 /Yr  
 16.37 /MCF    \$ 9,585,642 /Yr  
  
 4.51% /Yr  
 4.7% /Yr  
  
 0%    Reserve Rate: 0.00%  
  
 5%  
 25  
 \$0

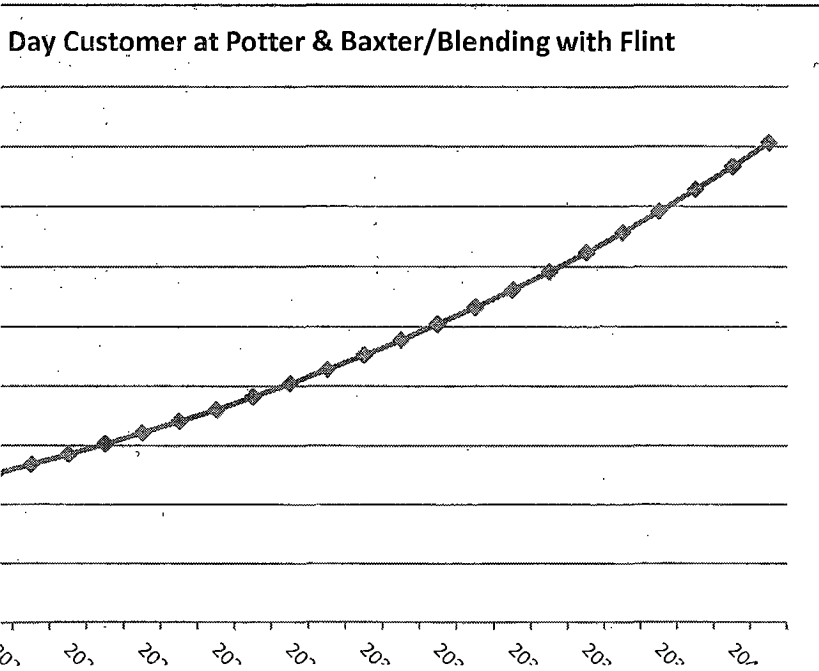


|      | <i>Backup</i> | Water      | Revenue         | Interest      |               |
|------|---------------|------------|-----------------|---------------|---------------|
| Year | Flint WTP O&M | Purchase   | Bond<br>Payment | on<br>Reserve | TOTAL         |
| 2013 | \$ 3,538,214  | 9,585,642  |                 | -             | \$ 13,123,856 |
| 2014 | \$ 3,697,788  | 10,036,167 |                 | -             | \$ 13,733,955 |
| 2015 | \$ 3,864,558  | 10,507,867 |                 | -             | \$ 14,372,425 |
| 2016 | \$ 4,038,850  | 11,001,736 | -               | -             | \$ 15,040,586 |
| 2017 | \$ 4,221,002  | 11,518,818 | -               | -             | \$ 15,739,820 |
| 2018 | \$ 4,411,369  | 12,060,203 | -               | -             | \$ 16,471,571 |
| 2019 | \$ 4,610,322  | 12,627,032 | -               | -             | \$ 17,237,354 |
| 2020 | \$ 4,818,247  | 13,220,503 | -               | -             | \$ 18,038,750 |
| 2021 | \$ 5,035,550  | 13,841,866 | -               | -             | \$ 18,877,416 |
| 2022 | \$ 5,262,653  | 14,492,434 | -               | -             | \$ 19,755,087 |
| 2023 | \$ 5,499,999  | 15,173,578 | -               | -             | \$ 20,673,577 |
| 2024 | \$ 5,748,049  | 15,886,736 | -               | -             | \$ 21,634,785 |
| 2025 | \$ 6,007,286  | 16,633,413 | -               | -             | \$ 22,640,699 |
| 2026 | \$ 6,278,215  | 17,415,183 | -               | -             | \$ 23,693,398 |
| 2027 | \$ 6,561,362  | 18,233,697 | -               | -             | \$ 24,795,059 |
| 2028 | \$ 6,857,279  | 19,090,681 | -               | -             | \$ 25,947,960 |
| 2029 | \$ 7,166,543  | 19,987,943 | -               | -             | \$ 27,154,486 |
| 2030 | \$ 7,489,754  | 20,927,376 | -               | -             | \$ 28,417,130 |
| 2031 | \$ 7,827,542  | 21,910,963 | -               | -             | \$ 29,738,505 |
| 2032 | \$ 8,180,564  | 22,940,778 | -               | -             | \$ 31,121,342 |
| 2033 | \$ 8,549,507  | 24,018,995 | -               | -             | \$ 32,568,502 |
| 2034 | \$ 8,935,090  | 25,147,887 | -               | -             | \$ 34,082,977 |
| 2035 | \$ 9,338,063  | 26,329,838 | -               | -             | \$ 35,667,901 |
| 2036 | \$ 9,759,209  | 27,567,341 | -               | -             | \$ 37,326,550 |
| 2037 | \$ 10,199,350 | 28,863,006 | -               | -             | \$ 39,062,355 |
| 2038 | \$ 10,659,340 | 30,219,567 | -               | -             | \$ 40,878,907 |
| 2039 | \$ 11,140,076 | 31,639,886 | -               | -             | \$ 42,779,963 |
| 2040 | \$ 11,642,494 | 33,126,961 | -               | -             | \$ 44,769,455 |
| 2041 | \$ 12,167,570 | 34,683,928 | -               | -             | \$ 46,851,499 |
| 2042 | \$ 12,716,328 | 36,314,073 | -               | -             | \$ 49,030,401 |

\$ 216,222,171  
**25 Yrs Cumulative**  
 \$ 596,916,044

**30 Yrs Cumulative**  
 \$ 821,226,268

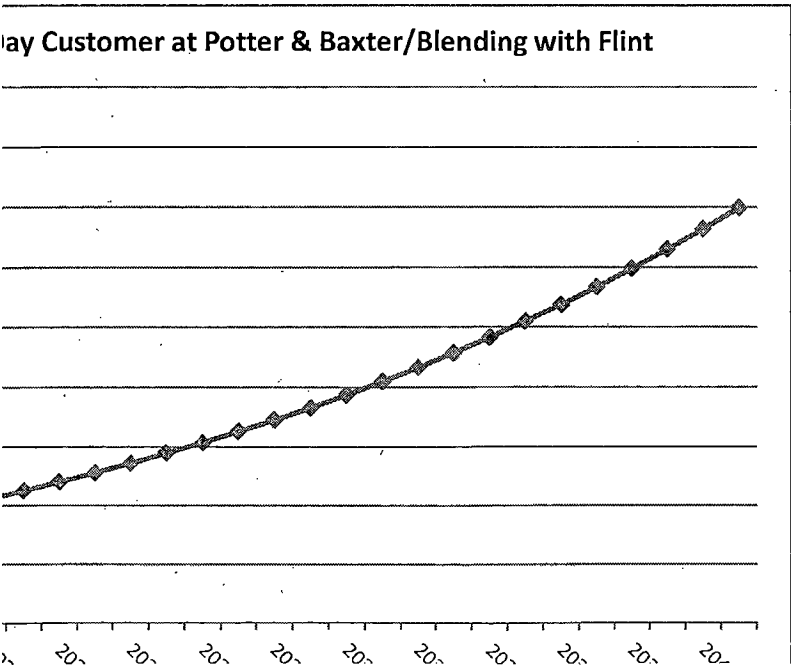
|                        |                  |    | Flint WTP |               | Water      | Revenue | Interest on |               |
|------------------------|------------------|----|-----------|---------------|------------|---------|-------------|---------------|
|                        |                  |    | Year      | O&M           | Purchase   | Bond    | Reserve     | TOTAL         |
|                        |                  |    |           |               |            | Payment |             |               |
| 4 MGD                  | 535 MCF/Day      | 1  | 2013      | \$ 5,895,097  | 6,367,005  |         | -           | \$ 12,262,103 |
| 8 MGD                  | 1,070 MCF/Day    | 2  | 2014      | \$ 6,160,966  | 6,666,255  |         | -           | \$ 12,827,221 |
|                        |                  | 3  | 2015      | \$ 6,438,826  | 6,979,569  |         | -           | \$ 13,418,395 |
|                        |                  | 4  | 2016      | \$ 6,729,217  | 7,307,608  | -       | -           | \$ 14,036,825 |
| 195,187 MCF            | 195187.1658      | 5  | 2017      | \$ 7,032,705  | 7,651,066  | -       | -           | \$ 14,683,771 |
| 390,374 MCF            |                  | 6  | 2018      | \$ 7,349,880  | 8,010,666  | -       | -           | \$ 15,360,546 |
|                        | 5895097.471      | 7  | 2019      | \$ 7,681,359  | 8,387,167  | -       | -           | \$ 16,068,527 |
|                        |                  | 8  | 2020      | \$ 8,027,789  | 8,781,364  | -       | -           | \$ 16,809,153 |
| 30.20 /MCF             | \$ 5,895,097 /Yr | 9  | 2021      | \$ 8,389,842  | 9,194,088  | -       | -           | \$ 17,583,930 |
| 16.31 /MCF             | \$ 6,367,005 /Yr | 10 | 2022      | \$ 8,768,224  | 9,626,210  | -       | -           | \$ 18,394,434 |
|                        |                  | 11 | 2023      | \$ 9,163,671  | 10,078,642 | -       | -           | \$ 19,242,313 |
|                        |                  | 12 | 2024      | \$ 9,576,952  | 10,552,338 | -       | -           | \$ 20,129,291 |
| 4.51% /Yr              |                  | 13 | 2025      | \$ 10,008,873 | 11,048,298 | -       | -           | \$ 21,057,171 |
| 4.7% /Yr               |                  | 14 | 2026      | \$ 10,460,273 | 11,567,568 | -       | -           | \$ 22,027,841 |
|                        |                  | 15 | 2027      | \$ 10,932,031 | 12,111,244 | -       | -           | \$ 23,043,275 |
|                        |                  | 16 | 2028      | \$ 11,425,066 | 12,680,473 | -       | -           | \$ 24,105,538 |
|                        |                  | 17 | 2029      | \$ 11,940,336 | 13,276,455 | -       | -           | \$ 25,216,791 |
|                        |                  | 18 | 2030      | \$ 12,478,845 | 13,900,448 | -       | -           | \$ 26,379,294 |
|                        |                  | 19 | 2031      | \$ 13,041,641 | 14,553,769 | -       | -           | \$ 27,595,410 |
| 0% Reserve Rate: 0.00% |                  | 20 | 2032      | \$ 13,629,819 | 15,237,796 | -       | -           | \$ 28,867,616 |
|                        |                  | 21 | 2033      | \$ 14,244,524 | 15,953,973 | -       | -           | \$ 30,198,497 |
| 5%                     |                  | 22 | 2034      | \$ 14,886,952 | 16,703,810 | -       | -           | \$ 31,590,762 |
| 25                     |                  | 23 | 2035      | \$ 15,558,354 | 17,488,889 | -       | -           | \$ 33,047,242 |
| \$0                    |                  | 24 | 2036      | \$ 16,260,035 | 18,310,866 | -       | -           | \$ 34,570,902 |
|                        |                  | 25 | 2037      | \$ 16,993,363 | 19,171,477 | -       | -           | \$ 36,164,840 |
|                        |                  |    | 2038      | \$ 17,759,764 | 20,072,537 | -       | -           | \$ 37,832,300 |
|                        |                  |    | 2039      | \$ 18,560,729 | 21,015,946 | -       | -           | \$ 39,576,675 |
|                        |                  |    | 2040      | \$ 19,397,818 | 22,003,695 | -       | -           | \$ 41,401,513 |
|                        |                  |    | 2041      | \$ 20,272,660 | 23,037,869 |         |             | \$ 43,310,528 |
|                        |                  |    | 2042      | \$ 21,186,956 | 24,120,649 |         |             | \$ 45,307,605 |



**25 Yrs Cumulative**  
\$ 554,681,686

**30 Yrs Cumulative**  
\$ 762,110,308

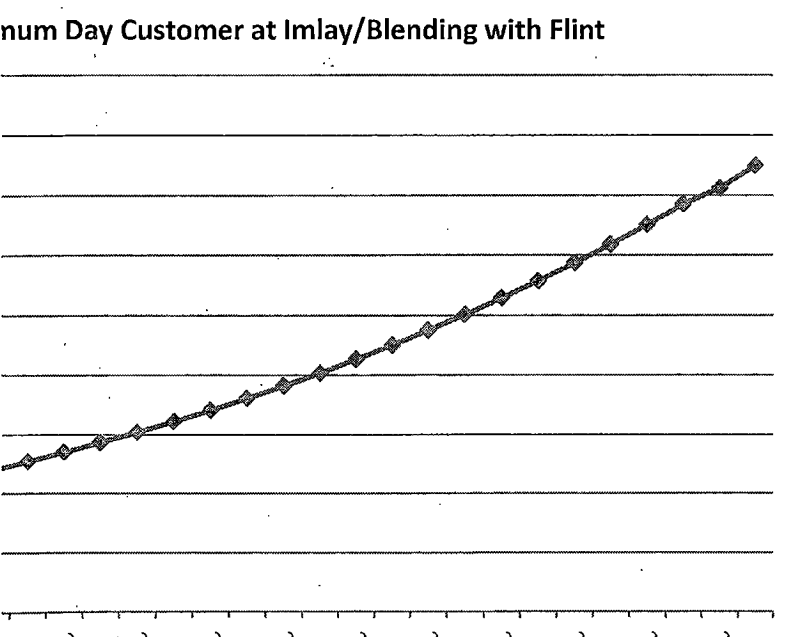
|                                                     |                  |  |    | Year | Flint WTP<br>O&M | Water<br>Purchase | Revenue<br>Bond<br>Payment | Interest on<br>Reserve | TOTAL         |
|-----------------------------------------------------|------------------|--|----|------|------------------|-------------------|----------------------------|------------------------|---------------|
| 4 MGD                                               | 535 MCF/Day      |  | 1  | 2013 | \$ 5,895,097     | 4,949,947         |                            | -                      | \$ 10,845,044 |
| 8 MGD                                               | 1,070 MCF/Day    |  | 2  | 2014 | \$ 6,160,966     | 5,182,594         |                            | -                      | \$ 11,343,560 |
|                                                     |                  |  | 3  | 2015 | \$ 6,438,826     | 5,426,176         |                            | -                      | \$ 11,865,002 |
|                                                     |                  |  | 4  | 2016 | \$ 6,729,217     | 5,681,206         | -                          | -                      | \$ 12,410,423 |
| 195,187 MCF                                         |                  |  | 5  | 2017 | \$ 7,032,705     | 5,948,223         | -                          | -                      | \$ 12,980,928 |
| 190,374 MCF                                         |                  |  | 6  | 2018 | \$ 7,349,880     | 6,227,789         | -                          | -                      | \$ 13,577,669 |
|                                                     |                  |  | 7  | 2019 | \$ 7,681,359     | 6,520,495         | -                          | -                      | \$ 14,201,855 |
|                                                     |                  |  | 8  | 2020 | \$ 8,027,789     | 6,826,959         | -                          | -                      | \$ 14,854,747 |
| 30.20 /MCF                                          | \$ 5,895,097 /Yr |  | 9  | 2021 | \$ 8,389,842     | 7,147,826         | -                          | -                      | \$ 15,537,668 |
| 12.68 /MCF                                          | \$ 4,949,947 /Yr |  | 10 | 2022 | \$ 8,768,224     | 7,483,774         | -                          | -                      | \$ 16,251,997 |
|                                                     |                  |  | 11 | 2023 | \$ 9,163,671     | 7,835,511         | -                          | -                      | \$ 16,999,182 |
|                                                     |                  |  | 12 | 2024 | \$ 9,576,952     | 8,203,780         | -                          | -                      | \$ 17,780,732 |
|                                                     |                  |  | 13 | 2025 | \$ 10,008,873    | 8,589,358         | -                          | -                      | \$ 18,598,230 |
| 4.51% /Yr                                           |                  |  | 14 | 2026 | \$ 10,460,273    | 8,993,057         | -                          | -                      | \$ 19,453,330 |
| 4.7% /Yr                                            |                  |  | 15 | 2027 | \$ 10,932,031    | 9,415,731         | -                          | -                      | \$ 20,347,762 |
|                                                     |                  |  | 16 | 2028 | \$ 11,425,066    | 9,858,271         | -                          | -                      | \$ 21,283,336 |
|                                                     |                  |  | 17 | 2029 | \$ 11,940,336    | 10,321,609        | -                          | -                      | \$ 22,261,945 |
|                                                     |                  |  | 18 | 2030 | \$ 12,478,845    | 10,806,725        | -                          | -                      | \$ 23,285,570 |
| -                                                   |                  |  | 19 | 2031 | \$ 13,041,641    | 11,314,641        | -                          | -                      | \$ 24,356,282 |
| - 0% Reserve Rate: 0.00%                            |                  |  | 20 | 2032 | \$ 13,629,819    | 11,846,429        | -                          | -                      | \$ 25,476,248 |
| -                                                   |                  |  | 21 | 2033 | \$ 14,244,524    | 12,403,211        | -                          | -                      | \$ 26,647,735 |
| 5%                                                  |                  |  | 22 | 2034 | \$ 14,886,952    | 12,986,162        | -                          | -                      | \$ 27,873,114 |
| 25                                                  |                  |  | 23 | 2035 | \$ 15,558,354    | 13,596,512        | -                          | -                      | \$ 29,154,866 |
| \$0                                                 |                  |  | 24 | 2036 | \$ 16,260,035    | 14,235,548        | -                          | -                      | \$ 30,495,583 |
|                                                     |                  |  | 25 | 2037 | \$ 16,993,363    | 14,904,619        | -                          | -                      | \$ 31,897,982 |
|                                                     |                  |  |    | 2038 | \$ 17,759,764    | 15,605,136        | -                          | -                      | \$ 33,364,899 |
| Pay Customer at Potter & Baxter/Blending with Flint |                  |  |    | 2039 | \$ 18,560,729    | 16,338,577        | -                          | -                      | \$ 34,899,306 |
|                                                     |                  |  |    | 2040 | \$ 19,397,818    | 17,106,490        | -                          | -                      | \$ 36,504,308 |
|                                                     |                  |  |    | 2041 | \$ 20,272,660    | 17,910,495        |                            |                        | \$ 38,183,155 |
|                                                     |                  |  |    | 2042 | \$ 21,186,956    | 18,752,288        |                            |                        | \$ 39,939,245 |
|                                                     |                  |  |    |      |                  |                   |                            |                        |               |



25 Yrs Cumulative  
\$ 489,780,792

30 Yrs Cumulative  
\$ 672,671,705

4 MGD                      535 MCF/Day  
 8 MGD                      1,070 MCF/Day  
  
 195,187 MCF  
 390,374 MCF  
  
 30.20 /MCF      \$ 5,895,097 /Yr  
 14.38 /MCF      \$ 5,613,583 /Yr  
  
 4.51% /Yr  
 4.7% /Yr  
  
 4,700,000  
 195,000      Check:      3.0%  
 975,000      Check:      5.0% /Yr (Bond Interest on Total)  
 650,000      Check:      10.0%  
 5,520,000  
 5%  
 25  
 \$462,610  
 3%



| Year    | Flint WTP<br>O&M | Water<br>Purchase | Bond<br>Payment | on<br>Reserve | TOTAL         |
|---------|------------------|-------------------|-----------------|---------------|---------------|
| 1 2013  | \$ 5,895,097     | 5,613,583         |                 | 19,500        | \$ 11,489,180 |
| 2 2014  | \$ 6,160,966     | 5,877,421         |                 | 19,500        | \$ 12,018,888 |
| 3 2015  | \$ 6,438,826     | 6,153,660         |                 | 19,500        | \$ 12,572,986 |
| 4 2016  | \$ 6,729,217     | 6,442,882         | 462,610         | 19,500        | \$ 13,615,209 |
| 5 2017  | \$ 7,032,705     | 6,745,698         | 462,610         | 19,500        | \$ 14,221,512 |
| 6 2018  | \$ 7,349,880     | 7,062,745         | 462,610         | 19,500        | \$ 14,855,735 |
| 7 2019  | \$ 7,681,359     | 7,394,694         | 462,610         | 19,500        | \$ 15,519,164 |
| 8 2020  | \$ 8,027,789     | 7,742,245         | 462,610         | 19,500        | \$ 16,213,144 |
| 9 2021  | \$ 8,389,842     | 8,106,131         | 462,610         | 19,500        | \$ 16,939,082 |
| 10 2022 | \$ 8,768,224     | 8,487,119         | 462,610         | 19,500        | \$ 17,698,452 |
| 11 2023 | \$ 9,163,671     | 8,886,013         | 462,610         | 19,500        | \$ 18,492,794 |
| 12 2024 | \$ 9,576,952     | 9,303,656         | 462,610         | 19,500        | \$ 19,323,718 |
| 13 2025 | \$ 10,008,873    | 9,740,928         | 462,610         | 19,500        | \$ 20,192,910 |
| 14 2026 | \$ 10,460,273    | 10,198,751        | 462,610         | 19,500        | \$ 21,102,134 |
| 15 2027 | \$ 10,932,031    | 10,678,093        | 462,610         | 19,500        | \$ 22,053,234 |
| 16 2028 | \$ 11,425,066    | 11,179,963        | 462,610         | 19,500        | \$ 23,048,139 |
| 17 2029 | \$ 11,940,336    | 11,705,421        | 462,610         | 19,500        | \$ 24,088,867 |
| 18 2030 | \$ 12,478,845    | 12,255,576        | 462,610         | 19,500        | \$ 25,177,531 |
| 19 2031 | \$ 13,041,641    | 12,831,588        | 462,610         | 19,500        | \$ 26,316,339 |
| 20 2032 | \$ 13,629,819    | 13,434,673        | 462,610         | 19,500        | \$ 27,507,602 |
| 21 2033 | \$ 14,244,524    | 14,066,102        | 462,610         | 19,500        | \$ 28,753,736 |
| 22 2034 | \$ 14,886,952    | 14,727,209        | 462,610         | 19,500        | \$ 30,057,271 |
| 23 2035 | \$ 15,558,354    | 15,419,388        | 462,610         | 19,500        | \$ 31,420,852 |
| 24 2036 | \$ 16,260,035    | 16,144,099        | 462,610         | 19,500        | \$ 32,847,245 |
| 25 2037 | \$ 16,993,363    | 16,902,872        | 462,610         | 19,500        | \$ 34,339,345 |
| 2038    | \$ 17,759,764    | 17,697,307        | 462,610         | 19,500        | \$ 35,900,181 |
| 2039    | \$ 18,560,729    | 18,529,080        | 462,610         | 19,500        | \$ 37,532,919 |
| 2040    | \$ 19,397,818    | 19,399,947        | 462,610         | 19,500        | \$ 39,240,875 |
| 2041    | \$ 20,272,660    | 20,311,745        |                 |               | \$ 40,584,404 |
| 2042    | \$ 21,186,956    | 21,266,397        |                 |               | \$ 42,453,353 |

25 Yrs Cummulative  
 \$ 529,865,071

30 Yrs Cummulative  
 \$ 725,576,803

|         |        |                                   |    | Year | Flint WTP<br>O&M | Water<br>Purchase | Bond<br>Payment | Interest on<br>Reserve | TOTAL         |
|---------|--------|-----------------------------------|----|------|------------------|-------------------|-----------------|------------------------|---------------|
| 4       | MGD    | 535 MCF/Day                       | 1  | 2013 | \$ 5,895,097     | 4,337,059         |                 | 19,500                 | \$ 10,212,656 |
| 8       | MGD    | 1,070 MCF/Day                     | 2  | 2014 | \$ 6,160,966     | 4,540,901         |                 | 19,500                 | \$ 10,682,367 |
|         |        |                                   | 3  | 2015 | \$ 6,438,836     | 4,754,323         |                 | 19,500                 | \$ 11,173,649 |
|         |        |                                   | 4  | 2016 | \$ 6,729,217     | 4,977,776         | 462,610         | 19,500                 | \$ 12,150,103 |
| 95,187  | MCF    |                                   | 5  | 2017 | \$ 7,032,705     | 5,211,732         | 462,610         | 19,500                 | \$ 12,687,546 |
| 190,374 | MCF    |                                   | 6  | 2018 | \$ 7,349,880     | 5,456,683         | 462,610         | 19,500                 | \$ 13,249,673 |
|         |        |                                   | 7  | 2019 | \$ 7,681,359     | 5,713,187         | 462,610         | 19,500                 | \$ 13,837,616 |
|         |        |                                   | 8  | 2020 | \$ 8,027,789     | 5,981,665         | 462,610         | 19,500                 | \$ 14,452,564 |
| 30.20   | /MCF   | \$ 5,895,097 /Yr                  | 9  | 2021 | \$ 8,389,242     | 6,262,803         | 462,610         | 19,500                 | \$ 15,095,755 |
| 11.11   | /MCF   | \$ 4,337,059 /Yr                  | 10 | 2022 | \$ 8,768,224     | 6,557,135         | 462,610         | 19,500                 | \$ 15,768,489 |
|         |        |                                   | 11 | 2023 | \$ 9,163,671     | 6,865,341         | 462,610         | 19,500                 | \$ 16,472,122 |
|         |        |                                   | 12 | 2024 | \$ 9,576,952     | 7,186,012         | 462,610         | 19,500                 | \$ 17,208,074 |
|         |        |                                   | 13 | 2025 | \$ 10,008,873    | 7,525,849         | 462,610         | 19,500                 | \$ 17,977,832 |
| 4.51%   | /Yr    |                                   | 14 | 2026 | \$ 10,460,273    | 7,879,564         | 462,610         | 19,500                 | \$ 18,782,947 |
| 4.7%    | /Yr    |                                   | 15 | 2027 | \$ 10,932,031    | 8,249,903         | 462,610         | 19,500                 | \$ 19,625,044 |
|         |        |                                   | 16 | 2028 | \$ 11,425,066    | 8,637,649         | 462,610         | 19,500                 | \$ 20,505,824 |
|         |        |                                   | 17 | 2029 | \$ 11,940,336    | 9,043,618         | 462,610         | 19,500                 | \$ 21,427,064 |
| 100,000 |        |                                   | 18 | 2030 | \$ 12,478,845    | 9,468,668         | 462,610         | 19,500                 | \$ 22,390,624 |
| 195,000 | Check: | 3.0%                              | 19 | 2031 | \$ 13,041,641    | 9,913,696         | 462,610         | 19,500                 | \$ 23,398,447 |
| 175,000 | Check: | 5.0% /Yr (Bond Interest on Total) | 20 | 2032 | \$ 13,629,819    | 10,379,639        | 462,610         | 19,500                 | \$ 24,452,569 |
| 150,000 | Check: | 10.0%                             | 21 | 2033 | \$ 14,244,524    | 10,867,482        | 462,610         | 19,500                 | \$ 25,555,117 |
| 120,000 |        |                                   | 22 | 2034 | \$ 14,886,952    | 11,378,254        | 462,610         | 19,500                 | \$ 26,708,316 |
| 5%      |        |                                   | 23 | 2035 | \$ 15,558,354    | 11,913,032        | 462,610         | 19,500                 | \$ 27,914,496 |
| 25      |        |                                   | 24 | 2036 | \$ 16,260,035    | 12,472,945        | 462,610         | 19,500                 | \$ 29,176,090 |
| 462,610 |        |                                   | 25 | 2037 | \$ 16,993,363    | 13,059,173        | 462,610         | 19,500                 | \$ 30,495,646 |
| 3%      |        |                                   |    | 2038 | \$ 17,758,764    | 13,672,954        | 462,610         | 19,500                 | \$ 31,875,828 |
|         |        |                                   |    | 2039 | \$ 18,560,729    | 14,315,583        | 462,610         | 19,500                 | \$ 33,319,422 |
|         |        |                                   |    | 2040 | \$ 19,397,818    | 14,988,415        | 462,610         | 19,500                 | \$ 34,829,343 |
|         |        |                                   |    | 2041 | \$ 20,272,660    | 15,692,271        |                 |                        | \$ 35,965,530 |
|         |        |                                   |    | 2042 | \$ 21,186,956    | 16,430,436        |                 |                        | \$ 37,617,392 |

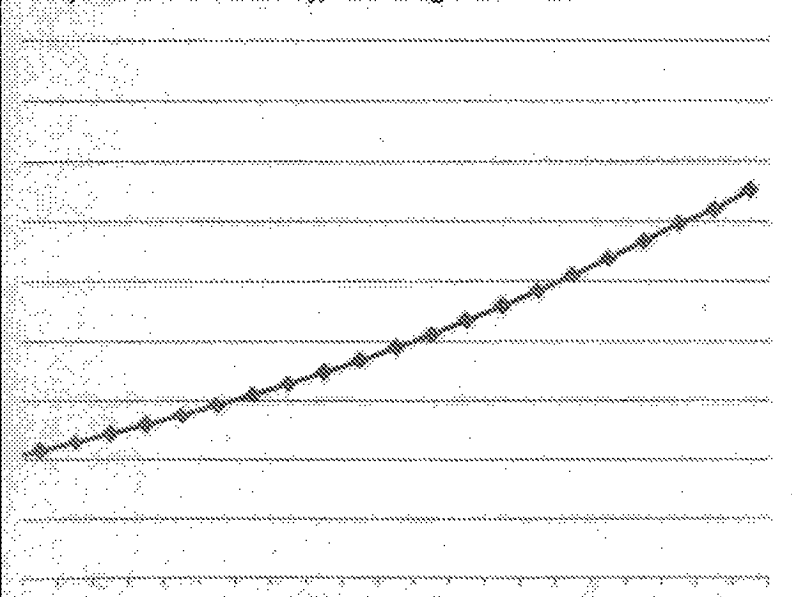
25 Yrs Cumulative

\$ 493,063,801

30 Yrs Cumulative

\$ 634,795,488

Day Customer at Imlay/Blending with Flint

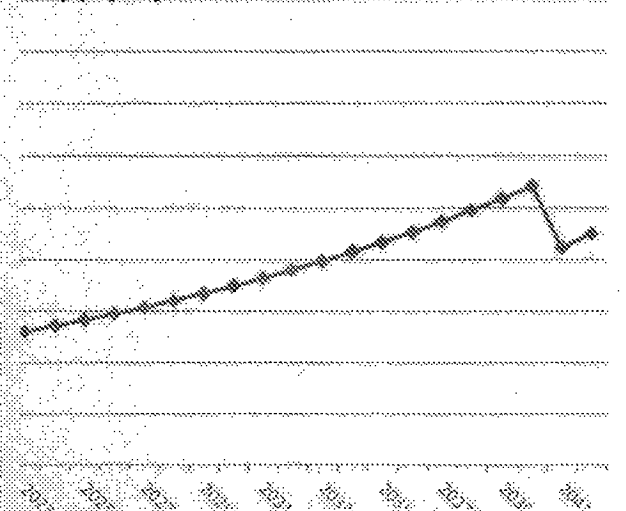


| Account   | Debt Service | Operating | Investment | TOTAL         |
|-----------|--------------|-----------|------------|---------------|
| Service   | Debt Service | s         | with KWA   |               |
|           |              |           |            | \$ 15,576,658 |
|           |              |           |            | \$ 15,936,535 |
|           |              |           |            | \$ 16,946,934 |
| 6,593,155 | 572,781      | 878,869   | 6,843,344  | \$ 14,888,149 |
| 6,593,155 | 572,781      | 922,812   | 7,185,511  | \$ 15,274,260 |
| 6,593,155 | 572,781      | 968,953   | 7,544,787  | \$ 15,679,676 |
| 6,593,155 | 572,781      | 1,017,401 | 7,922,026  | \$ 16,105,363 |
| 6,593,155 | 572,781      | 1,068,271 | 8,319,127  | \$ 16,552,334 |
| 6,593,155 | 572,781      | 1,121,684 | 8,734,034  | \$ 17,021,654 |
| 6,593,155 | 572,781      | 1,177,769 | 9,170,735  | \$ 17,514,440 |
| 6,593,155 | 572,781      | 1,236,697 | 9,629,272  | \$ 18,031,865 |
| 6,593,155 | 572,781      | 1,298,490 | 10,110,736 | \$ 18,575,162 |
| 6,593,155 | 572,781      | 1,363,414 | 10,616,273 | \$ 19,145,623 |
| 6,593,155 | 572,781      | 1,431,585 | 11,147,086 | \$ 19,744,607 |
| 6,593,155 | 572,781      | 1,503,164 | 11,704,441 | \$ 20,373,541 |
| 6,593,155 | 572,781      | 1,578,322 | 12,289,663 | \$ 21,033,921 |
| 6,593,155 | 572,781      | 1,657,239 | 12,904,146 | \$ 21,727,320 |
| 6,593,155 | 572,781      | 1,740,101 | 13,549,353 | \$ 22,455,390 |
| 6,593,155 | 572,781      | 1,827,106 | 14,226,821 | \$ 23,219,862 |
| 6,593,155 | 572,781      | 1,918,461 | 14,938,162 | \$ 24,022,559 |
| 6,593,155 | 572,781      | 2,014,384 | 15,685,070 | \$ 24,865,390 |
| 6,593,155 | 572,781      | 2,115,103 | 16,469,323 | \$ 25,750,362 |
| 6,593,155 | 572,781      | 2,220,838 | 17,292,789 | \$ 26,679,584 |
| 6,593,155 | 572,781      | 2,331,901 | 18,157,429 | \$ 27,655,266 |
| 6,593,155 | 572,781      | 2,448,496 | 19,065,300 | \$ 28,679,733 |
| 6,593,155 | 572,781      | 2,570,921 | 20,018,585 | \$ 29,755,422 |
| 6,593,155 | 572,781      | 2,699,467 | 21,019,494 | \$ 30,884,897 |
| 6,593,155 | 572,781      | 2,834,440 | 22,070,468 | \$ 32,070,845 |
|           |              | 2,976,162 | 23,173,992 | \$ 26,150,154 |
|           |              | 3,124,970 | 24,332,691 | \$ 27,457,662 |

30 Yrs Cumulative

\$ 549,775,166

## Supply Option



|        |                                   |  |    |      |    | Pre-bond Entry |                |            |               |             |    |            |       |
|--------|-----------------------------------|--|----|------|----|----------------|----------------|------------|---------------|-------------|----|------------|-------|
|        |                                   |  |    | Year |    | Flint WTP      | Water Purchase | Fee & Bond | Flint Revenue | Interest on |    |            |       |
|        |                                   |  |    |      |    | O&M            |                | Payment    | Bond Payment  | Reserve     |    |            | TOTAL |
| 2 MGD  | 1.604 MCF/Day                     |  | 1  | 2013 | \$ | 3,538,214      | 11,461,700     | 1,162,800  |               | 369,600     | \$ | 15,793,114 |       |
| 3 MGD  | 1.604 MCF/Day                     |  | 2  | 2014 | \$ | 3,697,788      | 12,034,785     | 1,214,400  |               | 369,600     | \$ | 15,944,373 |       |
|        |                                   |  | 3  | 2015 | \$ | 3,964,558      | 12,638,524     | 1,261,400  |               | 369,600     | \$ | 16,712,882 |       |
|        |                                   |  | 4  | 2016 | \$ | 7,913,118      | 878,869        | 7,968,562  | 756,946       | 369,600     | \$ | 17,147,885 |       |
| MCF    |                                   |  | 5  | 2017 | \$ | 8,270,000      | 922,812        | 7,968,562  | 756,946       | 369,600     | \$ | 17,548,721 |       |
| MCF    |                                   |  | 6  | 2018 | \$ | 8,642,977      | 968,953        | 7,968,562  | 756,946       | 369,600     | \$ | 17,967,838 |       |
|        |                                   |  | 7  | 2019 | \$ | 9,032,775      | 1,017,401      | 7,968,562  | 756,946       | 369,600     | \$ | 18,406,084 |       |
|        |                                   |  | 8  | 2020 | \$ | 9,440,153      | 1,068,271      | 7,968,562  | 756,946       | 369,600     | \$ | 18,864,332 |       |
| 1 /MCF | \$ 2,913,118 /Yr                  |  | 9  | 2021 | \$ | 9,865,904      | 1,121,684      | 7,968,562  | 756,946       | 369,600     | \$ | 19,343,497 |       |
| /MCF   | \$ 478,869 /Yr                    |  | 10 | 2022 | \$ | 10,310,857     | 1,177,769      | 7,968,562  | 756,946       | 369,600     | \$ | 19,844,533 |       |
|        |                                   |  | 11 | 2023 | \$ | 10,775,876     | 1,236,667      | 7,968,562  | 756,946       | 369,600     | \$ | 20,368,441 |       |
|        |                                   |  | 12 | 2024 | \$ | 11,261,868     | 1,298,490      | 7,968,562  | 756,946       | 369,600     | \$ | 20,916,266 |       |
|        |                                   |  | 13 | 2025 | \$ | 11,769,779     | 1,363,414      | 7,968,562  | 756,946       | 369,600     | \$ | 21,489,101 |       |
|        |                                   |  | 14 | 2026 | \$ | 12,300,596     | 1,431,589      | 7,968,562  | 756,946       | 369,600     | \$ | 22,088,089 |       |
|        |                                   |  | 15 | 2027 | \$ | 12,855,352     | 1,503,154      | 7,968,562  | 756,946       | 369,600     | \$ | 22,714,425 |       |
|        |                                   |  | 16 | 2028 | \$ | 13,435,129     | 1,578,322      | 7,968,562  | 756,946       | 369,600     | \$ | 23,369,359 |       |
|        |                                   |  | 17 | 2029 | \$ | 14,041,053     | 1,657,239      | 7,968,562  | 756,946       | 369,600     | \$ | 24,054,200 |       |
|        |                                   |  | 18 | 2030 | \$ | 14,674,305     | 1,740,101      | 7,968,562  | 756,946       | 369,600     | \$ | 24,770,313 |       |
|        |                                   |  | 19 | 2031 | \$ | 15,336,116     | 1,827,106      | 7,968,562  | 756,946       | 369,600     | \$ | 25,519,130 |       |
| Check: | 2.25%                             |  | 20 | 2032 | \$ | 16,027,775     | 1,918,461      | 7,968,562  | 756,946       | 369,600     | \$ | 26,302,144 |       |
| Check: | 5.0% /Yr (Bond Interest on Total) |  | 21 | 2033 | \$ | 16,750,627     | 2,014,384      | 7,968,562  | 756,946       | 369,600     | \$ | 27,120,919 |       |
| Check: | 10.0%                             |  | 22 | 2034 | \$ | 17,506,080     | 2,115,103      | 7,968,562  | 756,946       | 369,600     | \$ | 27,977,092 |       |
|        |                                   |  | 23 | 2035 | \$ | 18,295,609     | 2,220,898      | 7,968,562  | 756,946       | 369,600     | \$ | 28,872,371 |       |
|        |                                   |  | 24 | 2036 | \$ | 19,120,737     | 2,331,901      | 7,968,562  | 756,946       | 369,600     | \$ | 29,808,546 |       |
|        |                                   |  | 25 | 2037 | \$ | 19,983,082     | 2,448,496      | 7,968,562  | 756,946       | 369,600     | \$ | 30,787,486 |       |
|        |                                   |  |    | 2038 | \$ | 20,884,319     | 2,570,971      | 7,968,562  | 756,946       | 369,600     | \$ | 31,811,148 |       |
|        |                                   |  |    | 2039 | \$ | 21,826,201     | 2,699,467      | 7,968,562  | 756,946       | 369,600     | \$ | 32,881,577 |       |
|        |                                   |  |    | 2040 | \$ | 22,810,563     | 2,834,440      | 7,968,562  | 756,946       | 369,600     | \$ | 34,000,912 |       |
|        |                                   |  |    | 2041 | \$ | 23,833,320     | 2,976,182      |            |               |             | \$ | 36,815,482 |       |
|        |                                   |  |    | 2042 | \$ | 24,914,473     | 3,124,970      |            |               |             | \$ | 38,039,443 |       |

David Guastella:  
Assumes Bond Issuance and  
Reserve are not included

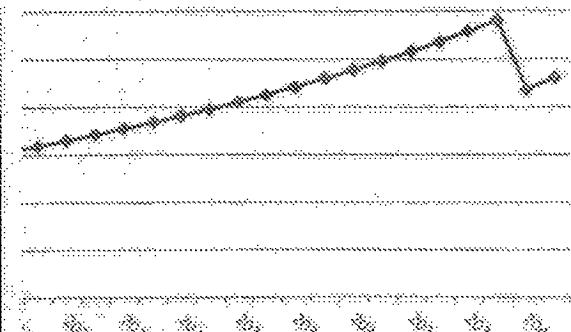
David Guastella:  
Increased by 3%/Yr to  
2012 \$'s

Check: 2.25%  
Check: 5.0% /Yr (Bond Interest on Total)  
Check: 10.0%

Supply Option

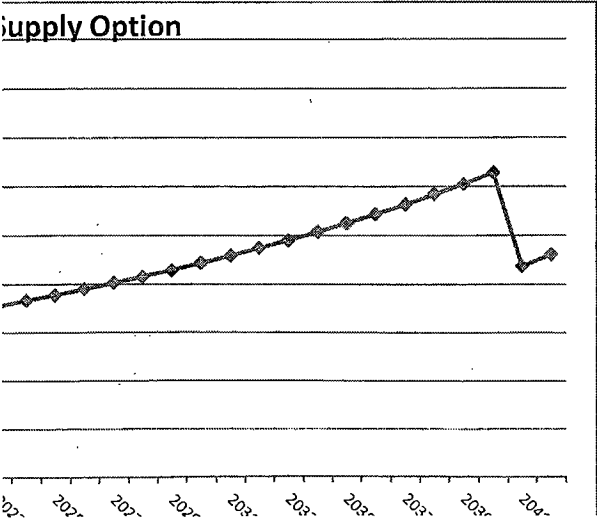
25 Yrs Cumulative  
\$ 553,731,153

30 Yrs Cumulative  
\$ 707,279,715





|          |                                   |    |      | Year | Flint WTP<br>O&M | Water Purchase | Fee & Bond<br>Payment | Flint Revenue<br>Bond Payment | Interest on<br>Reserve | TOTAL         |
|----------|-----------------------------------|----|------|------|------------------|----------------|-----------------------|-------------------------------|------------------------|---------------|
| 12 MGD   | 1,604 MCF/Day                     | 1  | 2013 | \$   | 3,538,214        | 11,461,700     | 1,162,800             |                               | 473,100                | \$ 15,689,614 |
| 12 MGD   | 1,604 MCF/Day                     | 2  | 2014 | \$   | 3,697,788        | 12,034,785     | 581,400               |                               | 473,100                | \$ 15,840,873 |
|          |                                   | 3  | 2015 | \$   | 3,864,558        | 12,636,524     | 581,400               |                               | 473,100                | \$ 16,609,382 |
|          |                                   | 4  | 2016 | \$   | 7,913,118        | 878,869        | 10,464,666            | 756,946                       | 473,100                | \$ 19,540,500 |
| 1 MCF    |                                   | 5  | 2017 | \$   | 8,270,000        | 922,812        | 10,464,666            | 756,946                       | 473,100                | \$ 19,941,325 |
| 1 MCF    |                                   | 6  | 2018 | \$   | 8,642,977        | 968,953        | 10,464,666            | 756,946                       | 473,100                | \$ 20,360,442 |
|          |                                   | 7  | 2019 | \$   | 9,032,775        | 1,017,401      | 10,464,666            | 756,946                       | 473,100                | \$ 20,798,688 |
|          |                                   | 8  | 2020 | \$   | 9,440,153        | 1,068,271      | 10,464,666            | 756,946                       | 473,100                | \$ 21,256,936 |
| 1 /MCF   | \$ 7,913,118 /Yr                  | 9  | 2021 | \$   | 9,865,904        | 1,121,684      | 10,464,666            | 756,946                       | 473,100                | \$ 21,736,101 |
| 0 /MCF   | \$ 878,869 /Yr                    | 10 | 2022 | \$   | 10,310,857       | 1,177,769      | 10,464,666            | 756,946                       | 473,100                | \$ 22,237,137 |
|          |                                   | 11 | 2023 | \$   | 10,775,876       | 1,236,657      | 10,464,666            | 756,946                       | 473,100                | \$ 22,761,045 |
|          |                                   | 12 | 2024 | \$   | 11,261,868       | 1,298,490      | 10,464,666            | 756,946                       | 473,100                | \$ 23,308,870 |
|          |                                   | 13 | 2025 | \$   | 11,769,779       | 1,363,414      | 10,464,666            | 756,946                       | 473,100                | \$ 23,881,705 |
| % /Yr    |                                   | 14 | 2026 | \$   | 12,300,596       | 1,431,585      | 10,464,666            | 756,946                       | 473,100                | \$ 24,480,693 |
| % /Yr    |                                   | 15 | 2027 | \$   | 12,855,352       | 1,503,164      | 10,464,666            | 756,946                       | 473,100                | \$ 25,107,029 |
|          |                                   | 16 | 2028 | \$   | 13,435,129       | 1,578,322      | 10,464,666            | 756,946                       | 473,100                | \$ 25,761,963 |
|          |                                   | 17 | 2029 | \$   | 14,041,053       | 1,657,239      | 10,464,666            | 756,946                       | 473,100                | \$ 26,446,804 |
| 0        |                                   | 18 | 2030 | \$   | 14,674,305       | 1,740,101      | 10,464,666            | 756,946                       | 473,100                | \$ 27,162,917 |
| 0 Check: | 2.25%                             | 19 | 2031 | \$   | 15,336,116       | 1,827,106      | 10,464,666            | 756,946                       | 473,100                | \$ 27,911,733 |
| 0 Check: | 5.0% /Yr (Bond Interest on Total) | 20 | 2032 | \$   | 16,027,775       | 1,918,461      | 10,464,666            | 756,946                       | 473,100                | \$ 28,694,748 |
| 0 Check: | 10.0%                             | 21 | 2033 | \$   | 16,750,627       | 2,014,384      | 10,464,666            | 756,946                       | 473,100                | \$ 29,513,523 |
| 0        |                                   | 22 | 2034 | \$   | 17,506,080       | 2,115,103      | 10,464,666            | 756,946                       | 473,100                | \$ 30,369,696 |
| 0        |                                   | 23 | 2035 | \$   | 18,295,605       | 2,220,858      | 10,464,666            | 756,946                       | 473,100                | \$ 31,264,975 |
| 8        |                                   | 24 | 2036 | \$   | 19,120,737       | 2,331,901      | 10,464,666            | 756,946                       | 473,100                | \$ 32,201,150 |
| %        |                                   | 25 | 2037 | \$   | 19,983,082       | 2,448,496      | 10,464,666            | 756,946                       | 473,100                | \$ 33,180,090 |
| 15       |                                   |    | 2038 | \$   | 20,884,319       | 2,570,921      | 10,464,666            | 756,946                       | 473,100                | \$ 34,203,752 |
| 16       |                                   |    | 2039 | \$   | 21,826,201       | 2,699,467      | 10,464,666            | 756,946                       | 473,100                | \$ 35,274,181 |
| %        |                                   |    | 2040 | \$   | 22,810,563       | 2,834,440      | 10,464,666            | 756,946                       | 473,100                | \$ 36,393,516 |
|          |                                   |    | 2041 | \$   | 23,839,320       | 2,976,162      |                       |                               |                        | \$ 26,815,482 |
| 2        |                                   |    | 2042 | \$   | 24,914,473       | 3,124,970      |                       |                               |                        | \$ 28,039,443 |
| 0 Check: | 2.25%                             |    |      |      |                  |                |                       |                               |                        |               |
| 0 Check: | 5.0% /Yr (Bond Interest on Total) |    |      |      |                  |                |                       |                               |                        |               |
| 0 Check: | 10.0%                             |    |      |      |                  |                |                       |                               |                        |               |



25 Yrs Cumulative  
\$ 606,057,940

30 Yrs Cumulative  
\$ 766,784,313

- John Lockheart Flint Resident  
TAFET Foundation  
↳ DEQ + Flint

- Ann New

- Hospitals

Issues w/ Hospitals  
Water Quality

DCH → Shannon Johnson → Legionella  
40 patients coming to them  
not within

- Dr Hassen

- 2-3 McLaren

---

DCH - Susan Boehm Mangum et

- Jim Hargry Gen

DCH → No add'l info

→ LND → Needs to

Just Gen Con

**Busch, Stephen (DEQ)**

**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 3:45 PM  
**To:** 'Richard Benzie P.E. (BENZIER@michigan.gov)'; Donaldson, Kristina (DEQ); 'Jon Bloemker P.E. (BLOEMKERJ@michigan.gov)'  
**Cc:** Shekter Smith, Liane (DEQ)  
**Subject:** FW: Flint Draft Response

At 1:30 today Mike Prysby and I attended an unplanned conference call between Director Wyant and Treasurer Dillon. Prior to the conference call I provided the director what I had put together at that point (see email below).

There was follow up discussion with the Director following the call and in addition to the response below he would like us to be prepared to discuss the following points:

1. Can we say to Treasury that KWA is a cost effective option? *Yes*
2. Can we say to Treasury that DWSD is a cost effective option? *Yes, Higher Risks to Flint*
3. Regulatory authority to allow/prevent water system breakups and local vs. state decisions about associated costs
  - a. Besides Benton Township and Norton Shores/Fruitport what other systems have pulled out of a regional system and what were the DW regulatory considerations?
4. How do/can we assess the dollar value on the benefits of a DWSD Regional water system vs. the cost differential?  
*KWA would be the largest*
  - a. In the TYJT report, the status quo option for Flint with DWSD vs. KWA cost estimate differential is \$172 million. *Advisory Board Meeting*
5. What unanswered questions do we have about the DWSD options in the TYJT report?  
*Previous Analysis*
  - a. 8/12 Blend
  - b. 12/8 Blend

I am still planning on a ODWMA meeting/conference call tomorrow morning at 9:00 to address the above and addend any additional comments before I provide a final response to the Director Wednesday afternoon in preparation for Thursday meetings.

Call me if you have any questions.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 12:37 PM  
**To:** Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)  
**Cc:** Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

Review in Red

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

- ✓ 1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.
- ✓ 2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
  - a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, without the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).
  - b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).
- ✓ 3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.
4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
  - ✓ a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)

- a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
  - b. Flint's need to utilize the Flint River as a source
9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits.
10. Major cost discrepancies in TYJT analysis
- a. Engineering, Legal, Administration, Contingency - TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
  - b. Pumping facilities - TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.
11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA. *if they remain with DWSD. Our indications are that they are currently final negotiations*
- a. City Lapeer
  - b. City of Inlay City

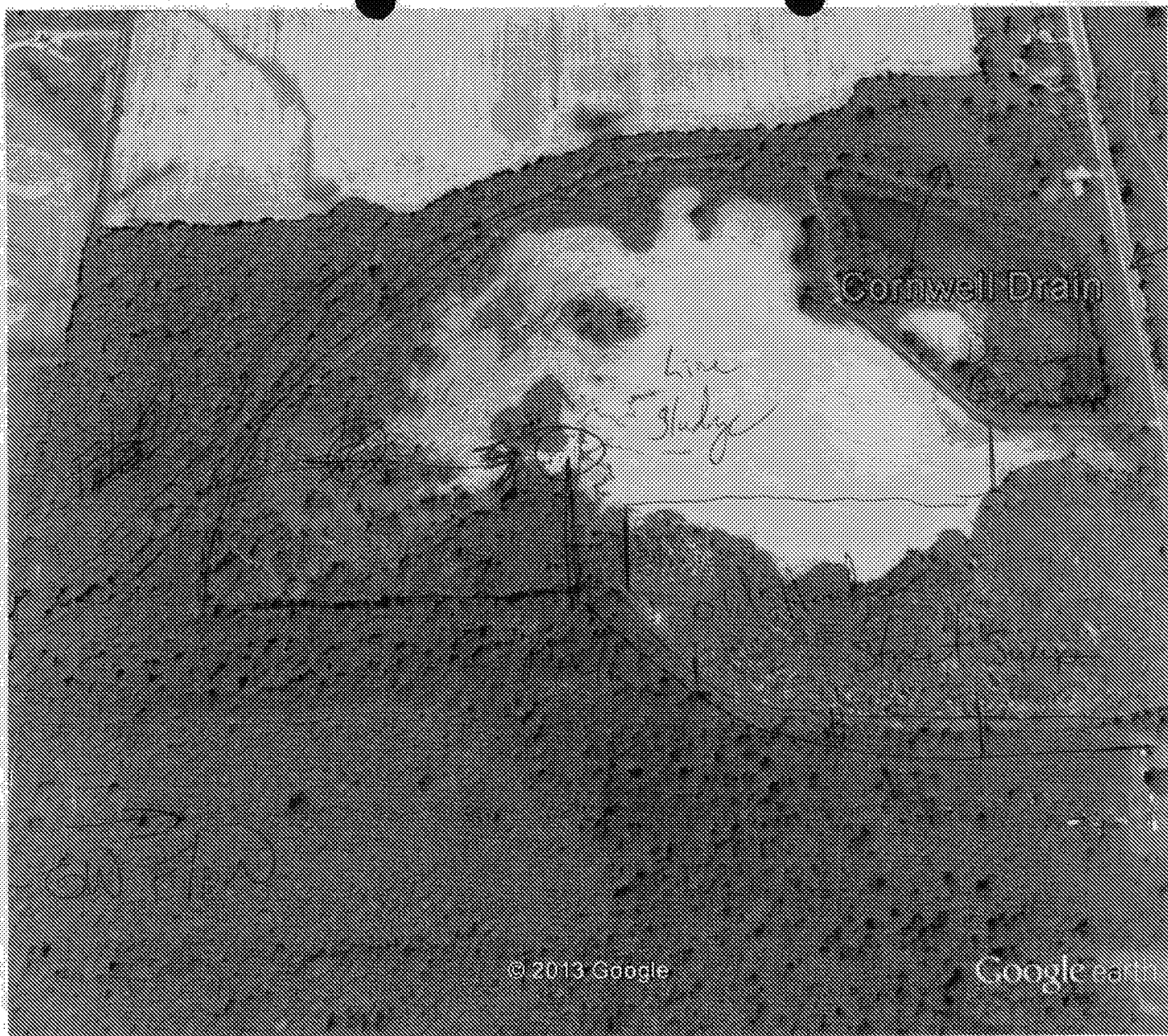
Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz.

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

*Attached*



Google earth      feet      City Square to South      1000  
meters      300

@ 12/1/61  
95,000 — 114,000 gpd

(30 day Storage)  
(Ozone Delay)

under KWA capital  
but still need redundancy





RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



DAN WYANT  
DIRECTOR

March 5, 2015

Mr. Brent Wright, Operations Supervisor  
City Of Flint - DPW  
Flint Water Plant  
4500 North Dort Highway  
Flint, Michigan 48505

WSSN: 02310

Dear Mr. Wright:

SUBJECT: Violation Notice (VN) – Maximum Contaminant Level for Total  
Trihalomethanes (TTHM)  
Operational Evaluation – Total Trihalomethanes  
1st Quarter 2015 Monitoring Period

The Department of Environmental Quality (DEQ), Office of Drinking Water and Municipal Assistance (ODWMA), records show that the city of Flint (City) is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399); R 325.10610, *Maximum contaminant levels for disinfection byproducts (MCLs)*, of the 1979 Administrative Code.

In accordance with R 325.10610, *MCLs*, of the 1979 Administrative Code, the MCL for disinfection byproduct TTHM is 0.080 milligrams per liter (mg/L) as a Locational Running Annual Average (LRAA) at each monitoring location. As listed in the table below, our records show that the City's highest TTHM locational running annual average (LRAA), based on the last four quarters, ending February 28, 2015, is 0.105 mg/L which exceeds the standard, and that two of the eight sample site locations exceed the standard of 0.080 mg/L.

Further, in accordance with R 325.10719I, *Disinfection byproducts: operational evaluation levels*, of the 1979 Administrative Code, when an operational evaluation level (OEL) at a monitoring location for TTHM exceeds 0.080 mg/L, a supply shall conduct an operational evaluation and submit a written report of the evaluation to the DEQ not later than 90 days after being notified of the analytical result that causes the supply to exceed the operational evaluation level. As listed in the table below, our records show that the TTHM OELs for the City exceed 0.080 mg/L at one of the City's eight sample site locations.

| TTHM Results (mg/L)                          |              |              |              |         |              |              |
|----------------------------------------------|--------------|--------------|--------------|---------|--------------|--------------|
|                                              | 5/21/14      | 8/21/14      | 11/20/14     | 2/17/15 | LRAA         | OEL          |
| DBP1 McDonalds<br>3719 Davison               | <b>0.162</b> | <b>0.145</b> | 0.059        | 0.0162  | <b>0.096</b> | 0.059        |
| DBP2 Liquor Palace<br>3302 S. Dort Highway   | <b>0.112</b> | <b>0.127</b> | 0.033        | 0.0168  | 0.072        | 0.049        |
| DBP3 North Flint Auto<br>6204 N. Saginaw St. | <b>0.097</b> | <b>0.118</b> | 0.041        | 0.0149  | 0.068        | 0.047        |
| DBP4 University Market<br>2501 Flushing Road | <b>0.106</b> | <b>0.196</b> | <b>0.094</b> | 0.0245  | <b>0.105</b> | <b>0.085</b> |
| DBP5 Taco Bell<br>3606 Corunna Road          | 0.079        | <b>0.181</b> | 0.034        | 0.0151  | 0.078        | 0.063        |
| DBP6 Rite-Aid Pharmacy<br>5018 Clio Road     | <b>0.088</b> | <b>0.144</b> | 0.054        | 0.0192  | 0.076        | 0.059        |
| DBP7 Salem Housing<br>3216 MLK Boulevard     | <b>0.082</b> | <b>0.112</b> | 0.050        | 0.0285  | 0.068        | 0.055        |
| DBP8 BP Gas Station<br>822 S. Dort Highway   | 0.075        | <b>0.112</b> | 0.036        | 0.0199  | 0.061        | 0.047        |

Our investigation consisted of a review of ODWMA files for laboratory reports received for compliance monitoring. Our investigation is considered complete. This violation began on March 1, 2015, and will continue until TTHM LRAA is below the MCL at all sample sites.

We are encouraged by the results from the most recent round of compliance samples collected on February 17, 2015, which now show individual TTHM levels at less than half of the 0.080 mg/L standard at all locations throughout the City's system. Operational Evaluation Reports from December 2014, and February 2015, have identified possible causes and corrective measures for the previous elevated TTHM levels which we encourage the City to continue implementing. These modifications have likely contributed in part to the reduction in TTHM levels reported in the most recent quarter, and suggest the City may be able to achieve compliance with the TTHM standard at all sites by continuing these efforts.

Our office is currently reviewing the Operational Evaluation Report dated February 27, 2015, and will provide the City and their consultant with comments, as needed, to help address this MCL violation.

Water systems that exceed the OEL must complete and submit an Operational Evaluation in accordance with Administrative Rule 719I (R 325.10719I) within 90 days of being notified of the violation. **An updated Operational Evaluation report, which incorporates the most recent sample results, must now be completed and received by our office by no later than Friday, May 29, 2015.**

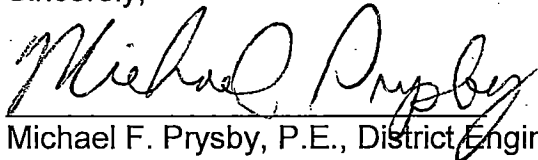
If you have any other factual information you would like us to consider regarding the violation identified in this VN, please provide them in a written response by March 19, 2015.



Administrative rule R 325.10403 of Act 399 requires that suppliers provide public notice (PN) as soon as practical, but no later than thirty (30) days after the supplier learns of this type of violation, by mail or direct delivery **and** by any other means reasonably calculated to reach customers not normally reached by mail. Enclosed is a sample PN which contains the minimum required language. The City is encouraged to include additional information regarding its response efforts to this violation. **Please notify your consumers by April 1, 2015, and send us a signed and dated copy of the notice that you issued within ten (10) days of distributing the public notice.** This violation must also be included in your 2015 Consumer Confidence Report, due by July 1, 2016. The PN must be repeated every quarter until you no longer exceed the TTHM standard. Failure to issue a PN for this violation will result in a fine of at least \$1,000 per event, with a maximum of \$5,000 per violation.

We anticipate and appreciate your continued cooperation in resolving this matter. If you have any questions regarding this VN, please contact us at the numbers below; at prysbym@michigan.gov; or rosenthal@michigan.gov; or at DEQ, P.O. Box 30242, Lansing, Michigan 48909-7742.

Sincerely,



Michael F. Prysby, P.E., District Engineer  
Lansing District Office  
Office of Drinking Water and Municipal  
Assistance  
517-290-8817



Adam Rosenthal, Environmental Quality  
Analyst  
Lansing District Office  
Office of Drinking Water and Municipal  
Assistance  
517-284-6644

Enclosure

cc: Ms. Jennifer Crooks, U.S. Environmental Protection Agency, Region 5  
Mr. Jerry Ambrose, Emergency Manager, City of Flint  
Mr. Robert Bincsik, City of Flint  
Mr. Howard Croft, City of Flint  
Mr. Daughtry Johnson, City of Flint  
Genesee County Health Department  
Ms. Liane Shekter Smith, DEQ  
Mr. Richard Benzie, DEQ  
Mr. Stephen Busch, DEQ

# IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

## City of Flint Did Not Meet Treatment Requirements

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Samples were collected for total trihalomethanes (TTHM) analysis from eight locations on a quarterly basis (May 21, August 21, November 20 of 2014, and February 17, 2015). The average of the results at **ANY** of the eight locations must not exceed the maximum contaminant level (MCL) for TTHMs, otherwise our water system exceeds the MCL. The standard for TTHMs is 80 micro grams per liter ( $\mu\text{g/L}$ ). The location reporting the highest TTHM level was 105  $\mu\text{g/L}$ ; thus, our water system exceeds the TTHM MCL.

### What should I do?

- There is nothing you need to do unless you have a severely compromised immune system, have an infant, or are elderly. These people may be at increased risk and should seek advice about drinking water from their health care providers.
- You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within 24 hours.

### What does this mean?

This is not an emergency. If it had been an emergency, you would have been notified within 24 hours.

*People who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer.*

### What is being done?

We are currently working on solutions to correct the problem. We anticipate resolving the problem in 2015. Our most recent individual sample results were all less than half the 80  $\mu\text{g/L}$  standard, however since compliance is calculated using a locational running annual average (LRAA) of the most recent four quarters, we are still out of compliance with the MCL at two of eight locations.

For more information, please contact Mr. Brent Wright at 517-787-6537, or the Flint Water Plant at 4500 North Dort Highway, Flint, Michigan 48505.

*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by the City of Flint.

---

### CERTIFICATION:

WSSN: 02310

I certify that this water supply has fully complied with the public notification requirements in the Michigan Safe Drinking Water Act, 1976 PA 399, as amended, and the administrative rules.

---

Signature

Title

Date Distributed

Reminder to water supplier: This notice/certification must be sent to the Department of Environmental Quality.

## FLINT SCHOOL TESTING RESULTS:

### WHAT DID WE FIND?

- 1) The results of the initial screening conducted over the course of the last week are consistent with the last round of community lead and copper testing.
- 2) There were a total of 37 samples taken from 13 schools. Of those 37 samples, 4 exceeded the 15 ppb action level. There were 3 schools that had samples exceeding the action level: Eisenhower Elementary (which had two samples exceeding 15 ppb). Brownell STEM Academy and Freeman Elementary each had one sample exceeding 15 PPB. The sample from Freeman Academy was significantly higher than the other samples at 101 PPB.
- 3) Looking at the data from a health based perspective, the data clearly demonstrates that more detailed sampling needs to occur so that the various sources of lead contamination contained within each respective school's plumbing can be identified and addressed.

### WHAT DOES THE DATA MEAN?

- 1) The data underscores the need for a complete and thorough evaluation of the plumbing system within each school.
- 2) We have developed a protocol for evaluating the plumbing systems and we will be working with schools to implement these protocols and to assist them in determining a corrective action plan to address this issue.
- 3) The State is identifying staff within DEQ, DHHS, LARA and Local County Health Departments to assist schools in conducting evaluations of their plumbing systems.

### WHAT IS YOUR PROTOCOL?

- 1) DEQ's protocols are based on similar work done in Michigan and in other States.
- 2) Multiple samples from each tap used for cooking or drinking water will be collected at prescribed intervals to identify levels of lead and its likely source.
- 3) Once an evaluation is complete, we will be able to assist each School in developing a comprehensive plan to address issues on a site specific basis.

## HOW DO SCHOOLS RESPOND?

- 1) Schools should continue protective measures that are currently in place until a complete study can be conducted at each school. This includes the continued use of bottled water for consumption purposes.
- 2) We will be reaching out to schools to schedule a complete evaluation, assessment and sampling, of their plumbing systems.

On stage (L to R):

Dan Kildee

LPHD representative

Susan Hedman

Dan Wyant

Harvey Hollins

Nick Lyon

Dr. Eden Wells

Dayne Walling

Sen. Ananich

10/2/2015

Kettering Univ.

Press Conf.

DEQ + DARS

Harvey Hollins

- Thank you all for being here today. I'm Harvey Hollins, Director of the Office of Urban Initiatives for Gov. Rick Snyder.
- We're here as representatives of local, state and federal government to talk about ensuring safe drinking water for everyone in Flint. We have with us today:
  - Nick Lyon, Director of the Michigan Department of Health and Human Services
  - Dr. Eden Wells, Chief Medical Executive for the Michigan Department of Health and Human Services
  - Dayne Walling, mayor of Flint
  - Susan Hedman, the Region 5 Administrator for the U.S. Environmental Protection Agency
  - Name, representing the Genesee County Health Department
  - Congressman Dan Kildee, representative for Michigan's 5<sup>th</sup> district.
  - State Sen. Jim Ananich, senator for Michigan's 27<sup>th</sup> district
  - And Dan Wyant, director of the Michigan Department of Environmental Quality. Dan?

Dan Wyant

- Thank you, Harvey. And thank you all for being here today.
- We know many residents are concerned about their health and the health of their children. We understand many have lost confidence in the drinking water system, and we need to build that back up. And we recognize we need to do more.
- We have an action plan to announce today that will address both the short- and long-term issues.
- It focuses on increasing water testing, offering additional precautions for families with lead plumbing in their homes, and providing long-term solutions to address the city's water infrastructure.
- The plan includes:

- Gov. Rick Snyder names Dr. Eden Wells as the Flint Drinking Water Public Health Advisor.
- Provide filters to residents of Flint.
- Offer premixed formula if test results indicate high levels of lead.
- Continue to disseminate advisories recommending residents flush their cold water pipes before use, as well as use only water from the cold water tap for drinking, cooking and especially for making baby formula.
- Immediately test all Flint public schools to ensure that drinking water is safe. Testing will also be available at no cost to any other school in Flint.
- Expand water testing of at-risk properties.
- Offer water testing at no cost to Flint residents to assure water is safe.
- Fully optimize corrosion controls in the Flint drinking water system by Nov. 1, 2015.
- Convene a "Safe Drinking Water Technical Advisory Committee" to ensure the best technology, practices and science are being utilized, and add an expert from the EPA's Office of Research and Development to the group.
- Accelerate water system improvements to address replacement of lead service lines.
- Expedite completion of Karegnondi Water Authority.
- In addition to these concrete action steps, we will keep open a parallel option of returning to the Detroit Water and Sewerage Department.
- Now, I want to turn the mic over to my colleague Nick Lyon to discuss some of these plans in more detail.

Nick Lyon

Discuss filters and Dr. Eden Wells' role

Dr. Eden Wells

Discuss Hurley's data, concern about blood lead levels

Dan Wyant

Discuss additional testing

Dayne Walling

Talk about advisories issued, free water testing available, next meeting of the Citizen Advisory Committee.

Susan Hedman

Introduce technical expert who will serve on Citizen Advisory Committee.

- ✓ OAG - (Legis) Request
- ✓ 2014 Monitoring Schedule
- ✓ MOR'S

- ✓ Lime Softening Start in MOR →
- ✓ 2 round reports + all 100 + 69 sample results
- ✓ 2 letters for 70th percentile

~~4th~~ 4th Floor



OAG Mtg. 10/15/2015

5 Ques. from a legislature

Systems w/ known issues - L  
- Violation identified - M  
- Surveys + site visits - S

TCR + LCR

5/2014 WTP

↓  
7-12/2014 → 100

↓  
90%

↳ 1/2015 - 6/30/2015 100

2/2015 → 100

3/2015 → 99,000 60

↓  
6/30/ 69 compliance

- Population #

- Service Connection

✓ - WTP w/ River → GMP Plant

✓ - Map of System

✓ - 1055 Section / 13024 / 113

✓ - Monitoring Reduction Table central



United States Environmental Protection Agency  
Regional Administrator  
Region 5  
77 West Jackson Boulevard  
Chicago, IL 60604-3590

SEP 15 2015

The Honorable Daniel Kildee  
Member, U.S. House of Representatives  
Washington, D.C. 20515-1313

Dear Congressman Kildee:

Thank you for your September 9, 2015 letter regarding drinking water quality in the City of Flint. EPA is actively working with the Michigan Department of Environmental Quality (MDEQ) to help the City provide clean and safe water.

Consistent with the recommendations in the internal memorandum cited in your letter, EPA is working with MDEQ to monitor Flint's compliance with the federal Lead and Copper Rule. On August 17, 2015, MDEQ notified Flint that additional treatment will be required to optimize corrosion control and the City is taking steps to do so. Experts from EPA's Office of Research and Development are providing technical assistance to Flint to implement those corrosion control improvements.

Flint residents who are concerned about lead in drinking water may request water sampling by the local water utility. General information about lead in drinking water and tips to reduce lead exposure are available at <http://water.epa.gov/drink/info/lead/index.cfm>

Again, thank you for your letter. We look forward to a more detailed discussion at the meeting that is being set up on Monday. In the meantime, if you have further questions, please contact me or your staff may contact Denise Fortin or Ronna Beckmann, the Region 5 Congressional Liaisons, at (312) 886-3000.

Sincerely,

A handwritten signature in black ink, appearing to read "S. Hedman".

Susan Hedman  
Regional Administrator

Resolution: 130165.2

Presented: 3-11-13

Adopted: 3-25-13

**AMENDED RESOLUTION TO PURCHASE CAPACITY  
FROM KAREGNONDI WATER AUTHORITY**

**BY THE MAYOR:**

The Karegnondi Water Authority (KWA) is a governmental consortium of cities and counties in southeastern Michigan that was created to build a water pipeline that will provide water from Lake Huron to interested communities in Sanilac, Lapeer, and Genesee counties. The incorporating bodies that created the KWA are Sanilac County, Lapeer County, Genesee County, the City of Flint, and the City of Lapeer.

The City of Flint is currently in a year to year contract with the City of Detroit for the purchase of water. A study was conducted that projected that staying with Detroit will cost the region \$2.1 billion over the next 25 years. In contrast, if the region builds its own pipeline, the projected costs are \$1.9 billion over the same period. After the initial 25 year period, the projected costs would be less than 25% of the projected water costs from Detroit.

In order to build the pipeline, the KWA needs commitment from its members regarding the capacity that each member will purchase in the pipeline. The KWA is allowed to withdraw 85 million gallons of water per day. Capacity is available to members in increments of 1 million gallons per day known as units. For each unit of capacity that a member purchases, the buyer shall pay to the KWA a one time fee of \$32,300.00. Additionally, the buyer shall pay to the KWA not less than \$32,300.00 per unit per year until such time as water is made available to the buyer. After water is made available, the buyer shall pay to the KWA an estimated amount not to exceed \$355,300.00 per unit per year until such time that the bonds are paid in full. If it is determined that the costs per unit will exceed \$355,300.00 the buyer has a right to cancel the contract.

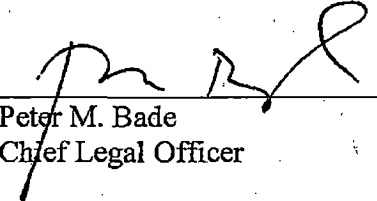
The purchase of capacity along with the payment of other costs necessary to operate the pipeline gives the member a right to water for sale to its customers. The buyer has a right to resell capacity and water rights. Each party entering into a capacity contract shall also be entitled to appoint additional board members equal to the party's percentage share of the total capacity under contract.

The City of Flint has decided that it is in its long term best interests to enter into a contract with the KWA to purchase SIXTEEN (16) units of capacity, plus TWO (2) units from the Flint River.


**IT IS RESOLVED** that City officials are authorized to enter into a contract with KWA to purchase SIXTEEN (16) units of capacity, plus TWO (2) units from the Flint River.

**IT IS FURTHER RESOLVED** that the City Administrator is authorized to provide KWA information needed to administer the contract and, with approval of the Chief Legal Officer, to make minor (non-material) modifications to the contract.


APPROVED AS TO FORM:

  
Peter M. Bade  
Chief Legal Officer

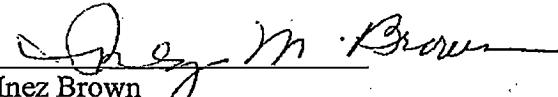
APPROVED AS TO FINANCE:

  
Gerald Ambrose  
Finance Director

APPROVED BY MAYOR:

  
Dayne Walling  
Mayor

APPROVED BY CITY COUNCIL  
ON: March 25, 2013

  
Inez Brown  
Clerk, City of Flint

APPROVED BY  
CITY COUNCIL

MAR 25 2013

## Frequently Asked Questions about Customer Tap water lead levels in the City of Flint – DRAFT 9/17

### **How was the Lead and Copper Rule Established?**

Under the Safe Drinking Water Act, EPA sets public health goals and enforceable standards for drinking water quality. The Lead and Copper Rule was established as a treatment technique rule because lead contamination of drinking water often results from corrosion of the plumbing materials belonging to water system customers, and there is no safe level of lead exposure. Therefore, instead of meeting a maximum contaminant level (MCL) for lead or copper, the rule requires public water supplies to take certain actions to minimize lead and copper in drinking water, to reduce water corrosivity and prevent the leaching of these metals from the premise plumbing. When that isn't sufficient, replacement of lead service lines under their control could be required. The current rule sets a monitoring action level (AL) which is not the same as an MCL. An MCL is based on health effects and feasibility; whereas an AL is a screening tool for determining when certain treatment technique actions are necessary.

### **What is the source of lead in customer tap water?**

Lead enters or leaches into water from lead service lines, lead solder, and leaded plumbing materials including fixtures, faucets, and fittings. Sampling at the Flint Water Treatment Plant has shown no lead in its treated water.

### **How is lead compliance determined?**

Compliance with the Action Level (AL) is based on a 90<sup>th</sup> percentile level calculation. For example, if 100 compliance samples were collected, the 90<sup>th</sup> percentile would be based on the result of the 11<sup>th</sup> highest lead sample for that monitoring period. Therefore, if more than ten percent of these compliance samples report lead above the AL of 15 parts per billion, a water supply has an AL exceedance. An exceedance is not a violation. It triggers other requirements which could include public notification, additional water quality sampling, and possibly further treatment.

### **What is the frequency of lead and copper sampling?**

Sampling periods can be as frequent as every six months to as little as once every three years. Reduction in sampling frequency is based on continued compliance with the Action Level and normally follows a progression of two six month periods, followed by annual sampling for three additional years, then one period every three years. Compliance samples can be collected at any time during six month sampling periods. When sampling is conducted annually or once every three years, all compliance samples are required to be collected between June 1 and September 30. This is done to capture warmest water conditions likely to produce the most leaching.

### **Why are customers asked to collect lead and copper samples?**

Compliance sampling for lead requires the water to, "have stood motionless in the plumbing system of each sampling site for not less than six hours." In order to achieve this requirement, residents are provided with detailed instructions and requested in general to collect the sample as the first thing they do when they wake up in the morning. It would be difficult for City water staff to otherwise collect such samples within the limits of the monitoring period.

### **How long has the City of Flint conducted lead monitoring?**

The City of Flint first began compliance monitoring for lead levels in customer taps as part of the Detroit Water and Sewerage Department (DWSD) consecutive system in January 1992 following the enactment of the Lead and Copper Rule. Two six month periods were collected in 1992. Sampling resumed with two six month periods in 1997 following the installation of Optimized Corrosion Control Treatment by

DWSD. A six month period was collected in 1998 and again in 1999. Annual sampling was completed in 2000, 2001, and 2002. Then triennial sampling was completed in 2005, 2008, and 2011 before the City of Flint changed sources and treatment in May 2014.

**Has the City's compliance monitoring ever exceeded the lead action level?**

No. While some individual samples do exceed the 15 part per billion (ppb) lead Action Level (AL), the AL is not a standard. Compliance is determined based on the 90<sup>th</sup> percentile value of all valid compliance sample results obtain during the established monitoring period. The City of Flint 90<sup>th</sup> percentile level has ranged between 0 ppb (2008 and 2011) and 15 ppb (1992), but never exceeded the AL. This includes the two most recent six month periods in 2014 and 2015 of 6 ppb and 11 ppb, respectively.

**Why are some samples not included in the compliance determination?**

Lead and Copper compliance sample sites must meet specific criteria that target customers with the highest potential for lead leaching. The sample must also be collected from a commonly used kitchen or bathroom tap, and in accordance with the provided sampling instructions. Customers that employ certain types of additional treatment are not allowed as such samples are not representative of water quality supplied by the water system. Samples must also be collected within the established monitoring period.

**What is the timeline for installation of corrosion control treatment?**

Under the Lead and Copper Rule treatment technique requirements, steps to complete the installation of optimal corrosion control treatment and follow-up monitoring are allowed to take up to five years. The City of Flint has committed to completing installation of optimal corrosion control treatment in less than six months.

**What will happen when Flint obtains water from the Karegnondi Water Authority?**

The City has committed to having Optimized Corrosion Control Treatment in place prior to its connection with the Karegnondi Water Authority (KWA). The water provided by KWA will come from a new source, Lake Huron. This change in source will require the City to return to two six month periods of lead and copper sampling and continued compliance with the Action Levels. The City of Flint water treatment plant will continue to operate with uninterrupted Optimized Corrosion Control Treatment.

**When is customer and public notification regarding lead required?**

Under the Lead and Copper Rule, public water supplies are required to provide individual lead results to those customers whose homes are sampled for compliance with the action level. Each of these customers is also provided information on actions they can take to limit lead exposure in their tap water. Furthermore, results from the most recent lead compliance monitoring determination are included each year in the annual consumer confidence report (CCR), also known as the annual water quality report that each water system must provide to all customers. As required by EPA, this report also includes general consumer awareness information regarding lead.

**How can I reduce lead in drinking water in homes with materials containing lead?**

Flush your pipes before drinking, and only use cold water for consumption. The more time water has been sitting in your home's pipes, the more lead it may contain. When water in a particular faucet has not been used for six hours or longer, "flush" your cold-water pipes by running the water until it becomes as cold as it will get. This could take as little as five to thirty seconds if there has been recent water use such as showering or toilet flushing. Otherwise, it could take two minutes or longer. Use only water from the cold-water tap for drinking, cooking, and especially for making baby formula. Hot water

is likely to contain higher levels of lead. The two actions recommended above are very important to the health of your family. They should be effective in reducing lead levels because most of the lead in household water usually comes from the plumbing in your house, not from the local water supply.

**How long would it take to replace lead service lines across Flint?**

The City has approximately 32,900 service connections in total. Over 15,000 of these connections are considered lead service lines. Even if many crews were contracted it could take up to 15 years to complete this work.

**What will it cost to have lead service lines replaced?**

Average costs have ranged from \$2,000 - \$8,000. Cost will vary depending on the length and size of service line that is needed, as well as the ground cover and soil conditions encountered.

With over 15,000 lead service lines at an estimated cost of \$4,000 for each replacement, a total cost could be \$60 million or more.

**Who is responsible for replacement of lead materials?**

Replacement of service pipes on private property and any leaded plumbing materials within the building structure is the homeowner/property owner's responsibility. The City of Flint owns the service pipe from the water main to the curb stop valve. This valve is normally located two feet in from the street curb.

**Why doesn't the City at least replace their portion of lead service lines?**

Partial lead service line replacement has been shown to exacerbate lead exposure, increasing the potential for harm, rather than reducing lead exposure. Only full lead service line replacement has been demonstrated effective in achieving long-term reductions in drinking water lead levels.

**How does blood lead level monitoring relate to customer tap water monitoring?**

Monitoring of blood lead levels takes into account all sources of lead exposure, not just exposure through drinking water. Water customers who have elevated levels of lead in their tap water, or who have a lead service line or plumbing materials containing lead are encouraged to be screened for blood lead level monitoring through their local county health department.

Blood lead level monitoring is overseen statewide by the Michigan Department of Health and Human Services. Their review of blood lead level testing results for the 12 month period just after the City of Flint changed its water source (May 2014 – April 2015) showed no significant change in the pattern of blood lead levels in comparison with levels reported for the previous three years. This data suggests the recent changes in source and treatment by the City of Flint water system have not increased lead exposure.

## **Thelen, Mary Beth (DEQ)**

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**From:** Wyant, Dan (DEQ)  
**Sent:** Wednesday, October 07, 2015 7:09 PM  
**To:** Scott, Allison (GOV); Muchmore, Dennis (GOV); Agen, Jarrod (GOV); Dickinson, Sarah (GOV); Emmitt, Beth (GOV)  
**Subject:** Flint Drinking Water Action Plan Update - FOIA EXEMPT AND ATTORNEY-CLIENT PRIVILEGED  
**Attachments:** City of Flint Water Funding Solution.pdf; FLINT SCHOOL TESTING RESULTS.DOCX; Drinking Water Regulations for Monitoring of Lead in Schools and Child C....doc; Response to Corrosion Control Questions.docx; Fwd: TAC Meeting Highlights; CC Meeting Minutes 3-25-2013 (1).doc; Flint.pdf; KWA Contract (amended) 130165.2.pdf

Governor Snyder,

I wanted to provide you with the attached documents to address a number of the questions that you are asking today. A full briefing for the press conference, including press release, talking points, run of show, and frequently asked questions, will be provided by your team. Included in this e-mail are the following attachments:

1. Flint Drinking Water FY 2016 supplemental budget request summary
2. Summary of the Flint schools water testing results and our response to the results
3. Drinking water regulations for monitoring lead in schools and child care centers
4. Response to the questions on corrosion control
5. Summary of today's Safe Drinking Water Technical Advisory Committee meeting
6. Flint City Council Minutes from March 25, 2013; the Resolution to Purchase Capacity from Karegnondi Water Authority; and the Amended Contract

### Other Updates

Mayor Duggan and Sue McCormick of DWSD were contacted, briefed, and are supporting tomorrow's announcement. Both have indicated they would provide positive comments supporting the decision.

Dan Wyant



## Press Conf. Call

10/16/2020

- |                         |                   |
|-------------------------|-------------------|
| - Eric Brown DC Officer |                   |
| - Jeff Kelly            | - Harvey Hallam   |
| - Sam Heaton            | - Dennis Muchmore |
| - Jeff Kelly            |                   |
| - Tinka Hyde            |                   |
| - Mayor Wiley           |                   |
| - Liane Shetter Smith   |                   |
| - Sue DAVIS             |                   |

### Team

- County Health Dir
- Co. Board of Comm.
- Council Pres + VP
- DPW + City Admin

1:15 Pre brief  
1:30 Start

30-40 person  
room

- Gov Office
- DEQ
- HHS

Q+A flow

NSF-53

Logistics contact: Amy Barth

- State of Emergency

↳ DAVIS Not considered

↳ mitigation activities but continue health advisory

- County Announcement @ 3:30

Public Health Emergency

Mayor

- Working Together

- Flint City Advisory

- County Advisory

Susan - Clarification

OCCT  
tissue  
pH + Pd  
dose?

Filters -

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE  
WASHINGTON, D.C.

|                                     |   |                                   |
|-------------------------------------|---|-----------------------------------|
| IN THE MATTER OF:                   | : | Proceedings Pursuant To           |
|                                     | : | Section 1431 of the Safe Drinking |
| City of Flint, Michigan; Michigan   | : | Water Act, 42 U.S.C. § 300i       |
| Department of Environmental         | : |                                   |
| Quality, and the State of Michigan, | : | EMERGENCY                         |
|                                     | : | ADMINISTRATIVE ORDER              |
| Respondents.                        | : |                                   |

I. INTRODUCTION

1. The Safe Drinking Water Act ("SDWA" or "Act") provides the U.S. Environmental Protection Agency ("EPA" or "Agency") with the authority to order actions when an imminent and substantial endangerment exists and the actions taken by the state and/or local authorities are inadequate to protect public health. EPA has determined that the City of Flint's and the State of Michigan's responses to the drinking water crisis in Flint have been inadequate to protect public health and that these failures continue. As a result, EPA is issuing this SDWA Emergency Order ("Order") to make sure that the necessary actions to protect public health happen immediately. The Order requires that necessary information be provided promptly to the public in a clear and transparent way to assure that accurate, reliable, and trustworthy information is available to inform the public and decisions about next steps. In addition to the issuance of this Order, EPA will promptly begin sampling and analysis of lead levels in tap water in the City of Flint's public water system ("PWS"). EPA will publish these sampling results on its website to provide the public with transparency into the process to abate the public health emergency in the City of

Flint. In the coming weeks, EPA may take additional actions under the SDWA to address the situation in the City of Flint.

## II. STATUTORY AUTHORITY

2. This Order is issued under the authority vested in the Administrator of the EPA by Section 1431 of the SDWA, 42 U.S.C. § 300i. This Order is issued for the purpose of protecting the health of persons who are supplied drinking water by a PWS with conditions that may present an imminent and substantial endangerment to human health.

## III. FINDINGS OF FACT

3. The City of Flint, Michigan ("City") owns and operates a PWS that provides piped drinking water for human consumption to its nearly 100,000 citizens.
4. From December 2011 through April 2015, an emergency manager was appointed by the State of Michigan ("State") under Public Act 436 to oversee the management of the City during its financial crisis. During that time, the City became a partner with the Karegnondi Water Authority ("KWA") and decided to no longer purchase treated drinking water from the Detroit Water and Sewerage Department ("Detroit").
5. The Michigan Department of Environmental Quality ("MDEQ") has primary responsibility for the implementation and enforcement of the public water system program in Michigan.
6. Before April 2014, the City purchased finished drinking water from Detroit.
7. On or around April 25, 2014, the City ceased purchasing treated drinking water from Detroit and began drawing water from the Flint River as its source water.

8. Between July and December 2014, the City conducted the first of two rounds of six month lead sampling under the Lead and Copper Rule ("LCR"), 40 C.F.R. § 141.80 *et seq.*
9. The City conducted the second of two rounds of six month lead sampling under the LCR between January and June 2015. These rounds of sampling showed that the levels of lead in the City water supply were rapidly rising.
10. On or about April 24, 2015, MDEQ notified EPA that the City did not have corrosion control treatment in place at the Flint Water Treatment Plant.
11. During May and June, 2015, EPA Region 5 staff at all levels expressed concern to MDEQ and the City about increasing concentrations of lead in Flint drinking water and conveyed its concern about lack of corrosion control and recommended that the expertise of EPA's Office of Research and Development should be used to avoid further water quality problems moving forward.
12. On July 21, 2015, EPA Region 5 discussed with MDEQ the City's lead in drinking water issues and implementation of the LCR and MDEQ agreed to require corrosion control as soon as possible.
13. On August 17, 2015, MDEQ sent a letter to the City recommending the City implement corrosion control treatment as soon as possible, but no later than January 1, 2016, and to fully optimize its treatment within six months.
14. On August 31, 2015, EPA Region 5 had a call with MDEQ to discuss outreach to citizens to reduce exposures to high lead levels in Flint drinking water and reiterate EPA's offer of technical assistance in implementing corrosion control treatment.

15. On September 3, 2015, Flint Mayor Dayne Walling announced that the City will implement corrosion control treatment and invited EPA corrosion control experts to join the Flint Technical Advisory Committee ("Flint TAC").
16. On September 27, 2015, EPA Region 5 Administrator Susan Hedman called MDEQ Director Dan Wyant to discuss the need for expedited implementation of corrosion control treatment, the importance of following appropriate testing protocols, urged MDEQ to enlist Michigan Department of Health and Human Services' involvement and discussed options to provide bottled water/premixed formula/filters until corrosion control is optimized.
17. On October 7, 2015, the Flint TAC met about the City's corrosion control and treatment. The Flint TAC recommended returning to Detroit water as the best course of action for the City.
18. On October 16, 2015, EPA established the Flint Safe Drinking Water Task Force ("EPA Flint Task Force") to provide the Agency's technical expertise through regular dialogue with designated officials from MDEQ and the City.
19. On or around October 16, 2015, the City switched back to purchasing finished water from Detroit, now called the Great Lakes Water Authority.
20. On November 25, 2015, the EPA Flint Task Force requested information that would allow EPA to determine the progress being made on corrosion control in the City; this information has not been received by EPA. This information includes water quality parameter measurements (pH, total alkalinity, orthophosphate, chloride, turbidity, iron, calcium, temperature, conductivity) in the distribution system. The EPA Flint Task Force has also made subsequent requests and recommendations.

<http://www.epa.gov/mi/flint-drinking-water-documents> The City is required by its MDEQ permit to monitor for these parameters at 25 sites quarterly and at 10 of these sites weekly. Because the City has not provided the information requested by the EPA Flint Task Force EPA does not have the information that would provide any assurance that contamination in the City's water system has been controlled.

21. On or around December 9, 2015, the City began feeding additional orthophosphate at the Flint Water Treatment Plant to begin optimizing corrosion control treatment.

Notwithstanding the orthophosphate addition, high levels of lead and other contaminants are presumed to persist in the City's water system until LCR optimization process, utilizing sampling and monitoring requirements, have confirmed lead levels have been reduced.

22. On December 14, 2015 the City declared an emergency.

23. On January 14, 2016, the Governor of the State requested a declaration of major disaster and emergency and requested federal aid.

24. On January 16, 2016, the President of the United States declared a federal emergency in the City.

25. The presence of lead in the City water supply is principally due to the lack of corrosion control treatment after the City's switch to the Flint River as a source in April 2014. The river's water was corrosive and removed protective coatings in the system. This allowed lead to leach into the drinking water, which can continue until the system's treatment is optimized.

26. Lead occurs in drinking water from two sources: lead in raw water supplies and corrosion of plumbing materials in the water distribution system (i.e., corrosion

byproducts). Most lead contamination is from corrosion byproducts. The amount of lead in drinking water attributable to corrosion byproducts depends on a number of factors, including the amount and age of lead bearing materials susceptible to corrosion, how long the water is in contact with the lead containing surfaces, and how corrosive the water in the system is toward these materials. *Final Rule: Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper*, 56 *Fed. Reg.* 26460, 26463 (June 7, 1991).

27. EPA has set the Maximum Contaminant Level Goal ("MCLG") at zero for lead because (1) there is no clear threshold for some non-carcinogenic lead health effects, (2) a substantial portion of the sensitive population already exceeds acceptable blood lead levels, and (3) lead is a probable carcinogen. 56 *Fed. Reg.* at 26467. Pregnant women, unborn children, and children under the age of six are particularly sensitive to lead exposure.
28. The concentration of lead in whole blood has been the most widely used index of total lead exposure. Lead exposure across a broad range of blood lead levels has been associated with a spectrum of patho-physiological effects, including interference with heme synthesis necessary in the formation of red blood cells, anemia, kidney damage, impaired reproductive function, interference with vitamin D metabolism, impaired cognitive performance (as measured by IQ tests, performance in school, and other means), delayed neurological physical development, and elevation in blood pressure. 56 *Fed. Reg.* 26467-68.
29. EPA finds that consumption of lead in water contributes to increase in blood lead levels. The Centers for Disease Control and Prevention uses a reference level of 5



micrograms per deciliter to identify children with elevated blood lead levels. This new level is based on the U.S. population of children ages 1 – 5 years who are in the highest 2.5% of children when tested for lead in their blood.

[http://www.cdc.gov/nceh/lead/acclpp/blood\\_lead\\_levels.htm](http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm)

30. Under the LCR, the “action level” for lead is the concentration of lead at which corrective action is required. 40 C.F.R. § 141.2.
31. EPA’s LCR includes requirements for corrosion control treatment, source water treatment, lead service line replacement, and public education. These requirements are triggered, in some cases, by lead and copper action levels measured in samples collected at consumers’ taps. The action level for lead is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during the monitoring period conducted in accordance with 40 C.F.R. § 141.86 is greater than 0.015mg/L (i.e., if the “90<sup>th</sup> percentile” is greater than 0.015mg/L). 40 C.F.R. § 141.80(c). When a large system exceeds this action level, the LCR requires the system to: 1) implement public education requirements; 2) implement all applicable source water treatment requirements specified by the primacy agency under 40 C.F.R. § 141.83; and (3) if the system is exceeding the action level after implementation of all applicable corrosion control and source water treatment requirements, then the system must replace lead service lines in accordance with 40 C.F.R. § 141.84.
32. All large systems (over 50,000 persons) are required to either complete corrosion control treatment steps in 40 C.F.R. § 141.91(d) or be deemed to have optimized corrosion control treatment under 40 C.F.R. § 141.81(b)(2) or (b)(3).

33. Based on the foregoing, EPA finds that water provided by the City to residents poses an imminent and substantial endangerment to the health of those persons. Those persons' health is substantially endangered by their ingestion of lead in waters that persons legitimately assume are safe for human consumption. This imminent and substantial endangerment will continue unless preventive actions are taken.
34. The City, MDEQ and the State have failed to take adequate measures to protect public health. Although some progress has been made in addressing the drinking water crisis in the City, there continue to be delays in responding to critical EPA recommendations and in implementing the actions necessary to reduce and minimize the presence of lead and other contaminants in the water supply both now and in the near future. The Respondents have failed and continue to fail to provide the information necessary for EPA, the EPA Flint Task Force and the City's PWS customers to fully understand and respond promptly and adequately to the current deficiencies. EPA remains concerned that the City lacks the professional expertise and resources needed to carry out the recommended actions and to safely manage the City's PWS.
35. In accordance with SDWA Section 1431(a), 42 U.S.C. § 300i(a), to the extent practicable EPA has consulted with state and local authorities regarding the information on which this EPA action is based.
36. This Order and the requirements set forth herein are necessary to ensure adequate protection of public health in the City.

37. As a result of the emergency, EPA will promptly begin sampling and analysis of lead levels and other contaminants in the City to assure that all regulatory authorities and the public have accurate and reliable information.
38. EPA will make its LCR sampling results available to the public on the Agency's website.

#### IV. CONCLUSIONS OF LAW

39. Section 1431 (a), 42 U.S.C. § 300i(a), specifies that the EPA Administrator, upon receipt of information that a contaminant which is present in or likely to enter a public water system that may present an imminent and substantial endangerment to the health of persons, and that State and local authorities have not acted to protect the health of such persons, may take such actions as she may deem necessary in order to protect the health of such persons.
40. The City owns and operates a "public water system" within the meaning of SDWA Section 1401.
41. MDEQ is an instrumentality of the State.
42. The City, State and MDEQ are "persons" as defined in SDWA Section 1401(c)(12).
43. Respondents' cessation of purchased water from Detroit and switch to the Flint River as its source water triggered a cascade of events that directly resulted in the contribution of lead and other "contaminants" that are within the meaning of SDWA Sections 1401(c)(6) and 1431 of the Act.
44. The contaminants introduced by Respondents are present in or likely to enter a PWS.
45. Based upon the information and evidence, EPA determines that Respondents' actions that resulted in the introduction of contaminants, which entered a public water system

and have been consumed and may continue to be consumed by those served by the public water system, present an imminent and substantial endangerment to the health of persons.

46. The lead and other contaminants will remain present in the PWS and will continue to present an imminent and substantial endangerment to the health of persons until the underlying problems with the corrosion control treatment and fundamental deficiencies in the operation of the PWS are corrected and sampling results confirm the lead and other contaminants are adequately treated.

47. Respondents have failed to take adequate measures to protect public health.

48. The EPA has consulted with the State and local authorities, to the extent practicable, to confirm the correctness of the information upon which this ORDER is based and to ascertain the actions which such authorities are or will be taking. All requisite conditions have been satisfied for the EPA action under SDWA Section 1431(a)(1), 42 U.S.C. § 300i(a)(1).

49. The EPA finds that there is an imminent and substantial endangerment to the people drinking water from the public water system of the City of Flint and that the actions taken by the State and/or the City are inadequate to protect public health. The actions required by this ORDER are necessary to protect the health of persons who are currently consuming or who may consume or use water from the City's PWS.

#### V. ORDER

Based on the foregoing Findings and Conclusions, and pursuant to Section 1431 of the Act, 42 U.S.C. 300i,

IT IS ORDERED:

### **Intent to Comply**

50. Within one day of the effective date of this Order, Respondents shall notify EPA in writing of their intention to comply with the terms of this Order. For the purposes of this Order, "day" shall mean calendar day.

### **Reporting Requirements**

51. Within five days of the effective date of this Order, the State shall create, and thereafter maintain, a publicly available website. Respondents must post on this website all reports, sampling results, plans, weekly status reports on the progress of all requirements and all other documentation required under this Order. The Respondents shall not publish to this website any personally identifiable information.

### **Response to EPA Flint Task Force Recommendations, Requests for Information and Sampling Activities**

52. The Respondents shall within 10 days of the effective date of this Order respond in writing, in accordance with Paragraph 51, to all of the EPA Flint Task Force's requests and recommendations made on November 25, 2015 and subsequent dates. The response shall include all actions Respondents have taken and intend to take in response to those requests and recommendations. The EPA Flint Task Force's requests and recommendations are publicly available at <http://www.epa.gov/mi/flint-drinking-water-documents>.

53. Within 10 days of the effective date of the Order the Respondents shall provide the following information in accordance with Paragraph 51:
- a. Water quality parameter measurements (pH, total alkalinity, orthophosphate, chloride, turbidity, iron, calcium, temperature, conductivity) in the distribution

system. The City is required by the MDEQ permit to monitor for these parameters at 25 sites quarterly and at 10 of these sites weekly;

- b. All lead in water testing results for the City since January 2013, including those not used for LCR compliance; and
- c. Identification of areas (e.g., zip codes, neighborhoods) in the City with elevated blood lead levels.

54. Within 10 days of the effective date of the Order, the Respondents shall provide, without publicly disclosing any personally identifiable information, the following directly to the EPA in accordance with Paragraph 66:

- a. Existing inventory of homes with lead service lines in Excel or a similar format;
- b. Addresses of homes that have had water service interruptions or street disturbances (e.g., water main breaks, road/sidewalk construction, etc.) within the last year; and
- c. Addresses of currently unoccupied homes.

55. Respondents shall cooperate with EPA as the Agency conducts LCR sampling and other diagnostic activities in the City.

#### **Treatment and Source Water**

56. To ensure that treated water meets finished water quality goals and is consistently maintained throughout the distribution system, that existing and potential plant operational and mechanical start-up issues are identified and addressed, and that water plant operations staff are proficient in treating the existing and new source water, Respondents shall comply with Paragraphs 57, 58 and 59.

57. Respondents shall maintain chlorine residual in the distribution system in accordance with SDWA and the National Primary Drinking Water Regulations ("NPDWRs").
58. The City shall continue to add corrosion inhibitors (e.g., orthophosphate booster) at levels sufficient to re-optimize corrosion control in the distribution system.
59. To address optimization of corrosion control for the system as operated with its current water source, within 14 days of the effective date of this Order the Respondents shall submit to MDEQ and post in accordance with Paragraph 51:
- a. Submit a plan and schedule to the MDEQ to review and revise as needed designated optimal corrosion control and water quality parameters as well as monitoring plans for LCR compliance and all other monitoring plans developed to ensure that the treatment plant is consistently and reliably meeting plant performance criteria and all other NPDWRs;
  - b. Submit a sampling plan for daily monitoring of water quality parameters in the distribution system with results compiled in a weekly report in an approved format; and
  - c. Submit an operations plan for the corrosion control equipment (storage day tanks, feed/injection systems), with results compiled in a weekly format that includes monitoring, calibration, verification (pump catch, etc.) as well as daily monitoring of finished water corrosion control parameters. Results shall be submitted and posted weekly.
60. Respondents shall not effectuate a transition to a new water source for the City's PWS (e.g., from KWA) until such time as they have submitted a written plan, developed through consultation with appropriate experts and after providing adequate

advanced notice and an opportunity for public comment, to MDEQ and in accordance with Paragraph 51, demonstrating that the City has the technical, managerial and financial capacity to operate its PWS in compliance with SDWA and the NPDWRs and that necessary infrastructure upgrades, analysis, and testing have been completed to ensure a safe transition. Such plans shall include, but not be limited to, provisions addressing:

- a. The impacts on corrosion control for any new source water and an operations plan for periodic use of existing sources of water;
- b. Completion of corrosion control study for any new sources;
- c. Implementation of a "performance period" that allows for the demonstration of the adequacy of treatment of the new water source to meet all NPDWRs before it can be distributed to residents; and
- d. The City's technical, managerial and financial capacity to meet SDWA's applicable requirements, including the NPDWRs, during and after the transition to any new water source.

#### **Treatment and Distribution System Management**

61. Within 15 days of the effective date of this Order, the City must demonstrate, and the MDEQ and State must ensure, the City has the necessary, capable and qualified personnel required to perform the duties and obligations required to ensure the PWS complies with the SDWA and the NPDWRs.
62. To ensure the City's PWS is adequately operated to meet SDWA and all NPDWRs; within 30 days of the effective date of this Order, the Respondents shall submit the steps they will take to develop and implement a distribution system water quality



optimization plan to MDEQ and in accordance with Paragraph 51, to evaluate and improve its programs that affect distribution system water quality, including: evaluating conditions within the distribution system; creating better documentation; and enhancing communication between the various utility functions that impact distribution system water quality. The MDEQ must ensure that this plan is adequate to ensure SDWA compliance and the State must ensure it is executed.

**Independent Advisory Panel ("IAP")**

63. Within seven days of the effective date of this Order, the MDEQ and State, with the City's input and concurrence, shall engage a panel of independent, nationally-recognized experts on drinking water treatment, sampling, distribution system operation, and members of the affected community to advise and make public recommendations to the City on steps needed to mitigate the imminent and substantial endangerment to the health of persons and general operation of the City's PWS to ensure compliance with SDWA and the NPDWRs.

64. The charge to the IAP will include the following:

- a. Make recommendations to the Respondents, and for consideration by the EPA, to ensure the safe operation of the City's PWS.
- b. Make other recommendations to the Respondents, and for consideration by the EPA, to better serve the community served by the City's PWS.

**VI. PARTIES BOUND**

65. The provisions of this Order shall apply to and bind Respondents and their officers, employees, agents, successors and assigns.

**VII. GENERAL PROVISIONS**

66. All submittals and inquiries pursuant to this Order shall be addressed to:

Mark Pollins, Director  
Water Enforcement Division  
Office of Enforcement and Compliance Assurance  
United States Environmental Protection Agency  
William Jefferson Clinton South Building  
1200 Pennsylvania Avenue NW  
Room 3104  
Washington, DC 20460  
pollins.mark@epa.gov

67. All plans, reports, notices or other documents submitted by Respondents under this Order shall be accompanied by the following statement signed by a responsible official.

*"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

68. Record preservation. Respondents shall retain, during the pendency of this Order, and for a minimum of six years after its termination, all data, records and documents in its possession or control, or which comes into its possession or the possession of its divisions, officers, directors, employees, agents, contractors, successors, and assigns, which relate in any way to this Order. After the above mentioned six year period, Respondents shall provide written notification to EPA 60 calendar days before the destruction of any data, records, or documents that relate in any way to this Order or its implementation. At the EPA's request, Respondents shall then make records available to the EPA for inspection and/or retention, or shall provide copies of any such records to EPA before discarding.

69. Within 10 days of the effective date of this Order, or at the time of retaining any agent, consultant, or contractor for the purpose of carrying out terms of this Order, Respondents shall enter into an agreement with any such agents, consultants, or contractors whereby such agents, consultants, or contractors will be required to provide Respondents a copy of all documents produced under this Order.
70. EPA retains all of its information gathering and inspections authorities and rights, including the right to bring enforcement actions related thereto, under SDWA and any other applicable statutes or regulations.
71. Pursuant to SDWA Section 1431(b), 42 U.S.C. § 300i, in the event Respondents violate, fail or refuse to comply with any of the terms or provisions of this Order, EPA may commence a civil action in U.S. District Court to require compliance with this Order and to assess a civil penalty of up to \$21,500 per day of violation under SDWA, as adjusted by the Federal Civil Penalties Inflation Adjustment Act of 1990, amended by the Debt Collection Improvement Act of 1996, and the subsequent Civil Monetary Penalty Inflation Adjustment Rule, 40 C.F.R. Part 19.
72. Compliance with the terms and conditions of this Order shall not in any way be construed to relieve Respondents of their obligations to comply with all applicable provisions of federal, state, or local law, nor shall it be construed to be a determination of any issue related to any federal, state, or local permit. Compliance with this Order shall not be a defense to any actions subsequently commenced for any violation of federal laws and regulations administered by EPA, and it is the responsibility of Respondents to comply with such laws and regulations.

73. EPA may modify this Order to ensure protection of human health and the environment. Such modification shall be in writing and shall be incorporated into this Order.

74. This Order shall constitute final agency action by EPA.

#### VIII. EFFECTIVE DATE

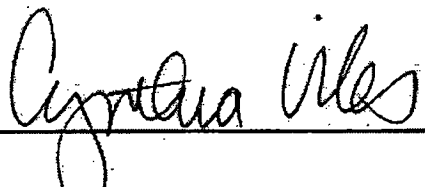
75. Under SDWA Section 1431, 42 U.S.C. § 300i, this Order shall be effective immediately upon Respondents' receipt of this Order. If modifications are made by the EPA to this Order, such modifications will be effective on the date received by Respondents. This Order shall remain in effect until the provisions identified in the Order have been met in accordance with written EPA approval.

#### IX. TERMINATION

76. The provisions of this Order shall be deemed satisfied upon Respondents' receipt of written notice from the EPA that Respondents have demonstrated, to the satisfaction of the EPA, that the terms of this Order, including any additional tasks determined by EPA to be required under this Order or any continuing obligation or promises, have been satisfactorily completed.

1/21/16

Date

  
\_\_\_\_\_

CYNTHIA GILES  
Assistant Administrator  
Office of Enforcement and Compliance Assurance  
United States Environmental Protection Agency  
William Jefferson Clinton South Building  
1200 Pennsylvania Avenue N.W.  
Washington, DC 20460

## Busch, Stephen (DEQ)

---

**From:** Lytle, Darren <Lytle.Darren@epa.gov>  
**Sent:** Monday, October 19, 2015 12:05 PM  
**To:** Prysby, Mike (DEQ)  
**Cc:** Schock, Michael; Kempic, Jeffrey; Busch, Stephen (DEQ)  
**Subject:** RE: Flint WTP PH2 SEG4 - Corrosion Control

Mike,

Thank-you for giving us the opportunity to review the city of Flint's corrosion control plan.

We believe it is necessary that Flint boosts orthophosphate dosage. Given that the distribution system has not received orthophosphate in over a year, we expect that orthophosphate will need to be boosted to 1) meet the demand of the distribution system, 2) reach the service lines and other lead-containing components in premise plumbing, and 3) accelerate lead reduction at the consumer's taps. Orthophosphate should preferably be added in the same form as the Detroit source which is phosphoric acid from our understanding. This is the proposed case here, however, a simple test should be performed to make sure that the pH is not impacted in a significant way at the desired target dose.

We have not been able to obtain comprehensive water quality data for the finished water characteristics of the Detroit water that will be fed to Flint, to assess ranges of major chemical characteristic fluctuations. However, based upon the email trail, Detroit water entering the Flint system appears to only contain around 0.4 PO4/L. This concentration range is entirely too low compared to that needed in studies presented and published in the last 20+ years that have focused on lead released directly from lead pipes, and the solubility of the most likely lead orthophosphate pipes scales. We also strongly feel that targeted dose of 0.8 mg PO4/L is also too low, for the very same reason. We would be glad to share with you numerous standard corrosion control and treatment reference works, best practices guides and published results from US and international lead corrosion control field and pilot studies. Secondly, the basis for that target (other communities using Lake Huron source use the same dose) is not scientifically derived nor does it consider water quality and the current state of Flint's distribution system. We have reviewed the original Detroit corrosion study and have seen some of the LCR monitoring data, and besides the fact that it did not directly pertain to this water source, few dosages were tested in the cited 1994 pipe loop study, and the higher dosage than the one implemented in the field currently was more effective. Based on the limited amount of data on the quality of Detroit water, what we know about the history of Detroit corrosion control, we think an orthophosphate residual of 3 to 4 mg PO4/L should be the minimum starting test target residual for pipe passivation. It is likely that, at least initially a higher dosage will be necessary to reach the far ends of the distribution system and sufficiently reduce lead solubility and release from all lead sources. To allow flexibility, we feel the design of the chemical feed and storage systems should be able to consistently deliver a maximum dose of 5 to 6 mg PO4/L, if substantial orthophosphate loss is observed, if the starting dose is set for the desired residual level of 3 to 4 mg/L as PO4. We suggest that jar tests be performed in advance of orthophosphate addition to Detroit water to evaluate the impact of orthophosphate dose on turbidity that could result from interactions between orthophosphate and background Detroit water quality parameters (e.g., aluminum, calcium, etc.).

We want to stress that immediately shifting to Detroit water and adding orthophosphate will not necessarily translate to immediate improvements. Furthermore, this is a change, albeit a return to past conditions. Nonetheless, a period of system upset should be anticipated. The need for a communication strategy and a distribution system plan are critical.

Lastly, we see no mention of a water quality monitoring program. Two programs need to be put in place immediately (before return to Detroit water) to 1) identify lead sources, 2) assess treatment effectiveness against lead release from all of the simultaneously operating mechanisms (solubility, particulate release, galvanic corrosion), and 3) assess orthophosphate levels and stability of water quality in the distribution system.

*Diagnostic to substantiate*

There are multiple sources of lead in the Flint distribution system to the consumers' taps, such as: pipes; leaded brass; leaded solder; accumulations on old galvanized steel pipes; possibly accumulated on copper or some plastic pipes. It is critical that the fate of orthophosphate in the distribution system is understood, and how effective it is against each type of lead source, so dosing adjustment can be properly made. For this purpose, we recommend that a number of residences throughout Flint that meet the following plumbing criteria, be identified for an assessment of the contribution lead from the different potential service line and interior plumbing sources, through detailed mapping of plumbing materials, lengths, sizes, and location and type of inline devices and faucets using profile sampling. For confidence in interpretation, probably at least 5 sites from each of the configurations will be necessary. The configurations we would estimate to be most important (but should be changed or added to if local construction practice indicates it's necessary): Lead service line, galvanized steel interior plumbing; lead service line, copper with leaded solder joints; lead service line, plastic interior plumbing. It is also possible that interior plumbing may differ from the material used for the customer-side service line segment. We would be glad to discuss the specifics of this sampling effort.

For the purpose of assessing stability of water quality in the distribution system and to inform on orthophosphate residual adjustment, we suggest that 8 to 10 locations in the distribution system be selected to measure pH, alkalinity, orthophosphate, turbidity and iron on a weekly basis. These could be collected from TCR sampling locations, or other readily-accessible buildings, should be located at a distribution of locations in the distribution system and should be collected after a flush sufficiently long to assure that "fresh" distribution system water is being measured. Research has shown that over time, orthophosphate can reduce disinfectant demand associated with corroding metallic distribution system materials. These measurements need to be performed in the field and can simply be done with a portable HACH test kit or spectrophotometer.

A lead sampling plan needs to be in place to access the effectiveness of water change and treatment boost. LCR monitoring sites with confirmed lead service lines can be in the sampling pool. Sampling should consist of a 1 liter first draw sample (LCR sample without 5 minute pre-flush), followed by an additional flushed sample or two depending on profile sample results which is intended to capture major lead source(s). The specific details of this effort need to be worked out by the technical committee as soon as possible. We would gladly work with Flint on establishing a water sampling program to identify and verify lead service line sites. The plan and initial sampling effort should be performed before the switch so that one baseline sample set is collected.

Lastly, our strength does not fall under full-scale pump and chemical feed delivery systems. We would only say that the systems need to be scaled-up in size to accommodate our suggested dosing needs. Also, there is the some discussion about diverting water to the Dort reservoir and an associated orthophosphate feed system. We are not familiar with the reservoir but are wondering if it is an open reservoir?

Of course this is a lot of information to share and we would gladly be available to discuss the technical and scientific basis for our suggestions.

Let us know if you have any questions and thanks again.

Darren and Mike

Darren A. Lytle, Ph.D., P.E.  
Branch Chief (Acting)  
U.S. Environmental Protection Agency  
26 West Martin Luther King Dr.  
Cincinnati, Ohio 45268  
Phone: (513) 569-7432  
Fax: (513) 487-2543  
email: lytle.darren@epa.gov

From: Prysby, Mike (DEQ) [mailto:PRYSBYM@michigan.gov]

Sent: Friday, October 16, 2015 1:32 PM

**To:** Lytle, Darren <Lytle.Darren@epa.gov>; Schock, Michael <Schock.Michael@epa.gov>  
**Cc:** Busch, Stephen (DEQ) <BUSCHS@michigan.gov>  
**Subject:** FW: Flint WTP PH2 SEG4 - Corrosion Control

Darren, Michael

We have received Flint's corrosion control proposal from their consultant. If you have comments, please provide them to me by Monday morning.

Michael Prysby, P.E.  
District Engineer  
Office of Drinking Water and Municipal Assistance  
517 290-8817

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**From:** Matta, Samir [<mailto:SFMatta@lan-inc.com>]  
**Sent:** Friday, October 16, 2015 12:02 AM  
**To:** Prysby, Mike (DEQ)  
**Subject:** Flint WTP PH2 SEG4 - Corrosion Control

Hi Mike,

Please see attached plans for the Corrosion Control Plan for the City of Flint. I will have the official submittal package to you tomorrow afternoon after I get Brent or Mike's signature on the permit application. I will call you when I get back in Lansing to drop the package. Is three sets of full size plans adequate? Would you like some half size plans? Let me know.

#### **Basis of Design**

Given that Flint will require lead and copper corrosion control and given that Detroit utilizes orthophosphate for their corrosion control methodology, and that Flint will be receiving Detroit water for the immediate future, orthophosphate is the appropriate corrosion control methodology for Flint. A dosage of 0.8 mg/l as  $\text{PO}_4$  has been recommended for the Detroit water. Numerous utilities utilizing Lake Michigan water have a target dosage of 0.9 mg/l as  $\text{PO}_4$ . Therefore, a target dosage in the range of 0.8 to 0.9 mg/l appears appropriate.

It is expected that, at least initially, there will be a significant  $\text{PO}_4$  demand in the system. This will require a significantly higher dosage until this demand is satisfied and the target residual can be maintained. We are therefore designing for capability of a maximum dosage of 1.5 mg/l.

The arriving Detroit water will likely have some residual  $\text{PO}_4$  when it arrives at Flint. It has been reported that this residual will be approximately 0.4 mg/l. The system must therefore be capable of a minimum dosage of 0.4 mg/l.

Based upon the usage of 75% Phosphoric Acid and a flow range of 4 MGD to 25 MGD, with an average day of 16 MGD, the expected feed rate will be 1.35 to 32 gpd. Average Phosphoric Acid feed is expected to be 10.8 gpd, requiring 30 days storage of 325 gal.

Orthophosphate will need to be applied at two locations. Detroit water will enter the Flint system at Control Station CS2, and supplementary phosphate will be applied there. However, on occasion some incoming water may need to be diverted to the Dort Reservoir, bypassing CS2. This water would then be introduced to the system through High Service Pump Station PS4 and phosphate would be introduced at this location.

Please let me know if the information is adequate or you require additional information.

Thanks.

**Samir F. Matta, PE**

Team Leader



**Lockwood, Andrews  
& Newnam, Inc.**

A LEO A DALY COMPANY

1311 South Linden Road, Suite B • Flint, MI 48532

2121 University Park Dr, Suite 100 • Okemos, MI 48864-6901

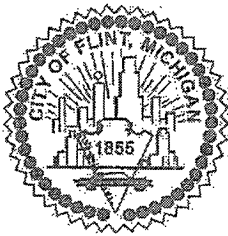
D 517.819.2367 C PPI

[www.lan-inc.com](http://www.lan-inc.com) • [sfmatta@lan-inc.com](mailto:sfmatta@lan-inc.com)

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## CITY OF FLINT

**Dayne Walling**  
Mayor

September 14, 2015

The Honorable Rick Snyder  
Governor, State of Michigan  
P.O. Box 30013  
Lansing, MI 48909

RE: Call for Additional Support for Flint Water Improvement Plan

Dear Governor Snyder:

On behalf of the Flint community, I am writing with a renewed request for additional support to address Flint's water challenges to ensure that water is affordable and secure for everyone in Flint especially our vulnerable populations. I am asking for an additional \$30 million in funds for Flint's infrastructure and a new healthy homes initiative.

Significant progress has been made throughout this year to increase water safety and quality and I thank you for the involvement of your office, the Michigan Department of Environmental Quality, and the Michigan Department of Treasury. A majority of items in the Water Improvement Plan are completed or underway. Most importantly, Flint is now in compliance with the Safe Drinking Water Act due in large part to the installation of the new carbon filter. The infrastructure systems are being made more secure and efficient through the State grants. Now the City is committed to following the recommendation of the Michigan Department of Environmental Quality to optimize the treatment process, reduce corrosion and further minimize risks from lead.

The need to accelerate the City's capital improvement investments remains and has been further increased by the continued financial stress and legal issues. Previously I requested support for replacement or forgiveness of payment to the Drinking Water Revolving Loan Fund due to Flint's status as a distressed community and the gap in funding in the adopted capital improvement plan. I understand that the existing federal law does not allow the existing Drinking Water Revolving Loans that Flint is carrying to be forgiven in retrospect but the need still exists. Flint owes approximately \$20 Million. One solution is for the State to grant a new \$20 Million that is designed as forgivable from the start. Another solution is to provide

The Honorable Rick Snyder

September 14, 2015

Page 2

equivalent funding through an expansion of the grant program to Michigan's Financially Distressed Cities, Villages and Townships with a supplemental budget amendment in cooperation with the State Legislature.

The community's heightened concern about lead leeching into the water from old service lines and home plumbing also needs to be addressed. We know that lead is an environmental contaminant and there have been many programs in place over the years to address sources in paint and pipes. Flint needs a new healthy homes initiative specifically focused on lead in water with \$10 Million to start the process of replacing service lines for the most vulnerable households. Regardless of the source and treatment of Flint's water, this long term threat of lead in pipes needs to be removed in the interest of public health.

My approach continues to be to work with you and your appointed officials, State Senator Ananich, State Representatives Phelps and Neeley, Congressman Kildee, community groups, businesses, churches, foundations, the Flint City Council, and all of the City of Flint and State and Federal government personnel. We need every available expert and resource to address Flint's water problems.

Flint's safety is my top priority. Just as the City and State have worked together on public safety, we need additional support for fixing the water problems. We need \$30 Million in new funds to repair and update the city-wide infrastructure and to assist households in becoming lead-free. The entire Flint community deserves sustainable, safe, secure and affordable water now and into the future. Thank you for the consideration Governor and I look forward to future discussions.

Sincerely,



Dayne Walling  
Mayor, City of Flint

CC: Flint City Council President Joshua Freeman; Congressman Dan Kildee; State Senator Jim Ananich; State Representative Sheldon Neeley; State Representative Phil Phelps; EPA Regional Administrator Dr. Susan Hedman; Chief of Staff Dennis Muchmore



## CITY OF FLINT

**Dayne Walling**  
Mayor

January 18, 2015

The Honorable Rick Snyder  
Governor, State of Michigan  
P.O. Box 30013  
Lansing, MI 48909

**RE: Flint Water Improvement Plan**

Dear Governor Snyder:

On behalf of the Flint community, I am writing to convey serious concerns about water quality and to request your support for my proposed Flint Water Improvement Plan. Access to safe and clean water is a basic human right, and, therefore, policy and budget decisions need to ensure that water is affordable and secure for everyone in Flint and all across Michigan. It is essential there is City, State and Federal cooperation to address the challenges here and to meet the needs of vulnerable populations.

The Flint Water Improvement Plan is focused in five areas: safety, quality, access, investment and education. The plan puts safety and quality first because this is fundamental. It is designed to be a sustainable solution for the City of Flint and the community as we move towards a new permanent water supply from Lake Huron through the Karegnondi Water Authority. My plan offers new ideas and also builds on successful models of utility, energy and assistance programs at the State and Federal levels.

**Safety & Quality**

- 100% Safety is the standard
- City of Flint reports testing data to the public to assure safety and expands testing sites and frequency
- Bring on experienced river water treatment operational management in the City of Flint

**Access**

- Announce an amnesty program for Flint water service turn-ons and reduce the turn-on fee
- Develop a revised affordable payment plan policy to encourage customers to return
- Design Federal and State partnership to establish new Drinking Water Emergency Assistance Fund for the elderly and vulnerable families

**Investment**

- Accelerate water system improvements outlined in the City of Flint Capital Improvement Plan through Federal and State Investments
  - State approves City of Flint's Distressed Cities Fund applications

- Federal and State support for replacement or forgiveness of payment to the Drinking Water Revolving Loan Fund due to Flint's status as a distressed community
- Federal and State grants for infrastructure improvements in alignment with the Flint Master Plan
- City Water Department implements budgeted FY15 projects including leak detection, valve repairs, new pipes and meter replacements

#### Education

- Develop a community partnership with universities to provide household and business customers with information on testing and conservation
- Ongoing partnership with Michigan Department of Human Services, United Way, Salvation Army and community organizations to provide information and water assistance with the Keep the Water Flowing Fund and support services
- Expand youth energy initiative to assist households with conservation and efficiency (piloted in summer 2014 with Northwestern High School students, EcoWorks and Consumers Energy)

It is also critical to restore the public confidence in Flint Water. The implementation of this plan must be accompanied by extensive community engagement including local elected officials. My objective is to work with you and your appointed officials, State Senator Ananich, State Representatives Phelps and Neeley, Congressman Kildee, community groups, businesses, churches, foundations, the Flint City Council, and all of the City of Flint and government personnel.

It is imperative that we communicate better and provide residents more information. I understand representatives from the Michigan Department of Environmental Quality will be joining a public forum this week at City Hall. This engagement going forward is vital so thank you for supporting their efforts. I think this issue of transparency is important for communities all across the State. I recommend a review of the applicable laws and policies and, at a minimum, a new requirement that water testing data be reported publicly no less than quarterly by law in all Michigan communities in Flint's population category.

Thank you for the consideration Governor. There is nothing more important in Flint right now than fixing the water problems. We must work together to identify funds to repair and update the water treatment facilities and city-wide infrastructure and to help those persons without access to clean water so that the entire Flint community has sustainable, safe, secure and affordable water now and into the future. This is an important issue for the state of our State of Michigan and I urge you to work with us to implement solutions.

Sincerely,



Dayne Walling, Mayor  
City of Flint

CC: Flint City Council President Joshua Freeman; Congressman Dan Kildee; State Senator Jim Ananich; State Representative Sheldon Neeley; State Representative Phil Phelps; Flint Emergency Manager Jerry Ambrose

1/28/2015 Mtg. w/ Harley Hospital + McLaren  
on Legionella (DCH/DHHS) called-in

3/17/2015 Water Quality Optimization Strategy emailed  
to Flint

4/29/2015 Mtgs on Secondary Treatment + Safety Plan/AASCP  
- Harley  
- McLaren

5/1/2015

Emails to Hospitals

+ City of Flint Plumbing Inspector

4/29/2015 Mtg. w/ Flint Plumbing Staff  
on customer identification  
+ questionnaire

3/19/2015



**Water Quality Monitoring**  
1st Quarter 2015

2310

| SAMPLE POINT IDENTIFICATION    |                                                        |             |       | PARAMETERS AND RESULTS |                   |         |                                            |                                  |
|--------------------------------|--------------------------------------------------------|-------------|-------|------------------------|-------------------|---------|--------------------------------------------|----------------------------------|
| Distribution System Location # | Sample Point Name & Address                            | Sample Date | Time  | Temperature (C)        | Conductivity (mS) | pH (su) | Total Alkalinity (mg/L CaCO <sub>3</sub> ) | Calcium (mg/L Ca <sup>2+</sup> ) |
| #1                             | Arby's<br>3742 Davison Rd.                             | 3/4/2015    | 10:11 | 6.5                    | 0.594             | 7.65    | 119                                        | 70.5                             |
| #2                             | BP Gas Station<br>822 S.Dort Hwy                       | 3/4/2015    | 10:34 | 3.6                    | 0.594             | 7.77    | 128                                        | 71.3                             |
| #3                             | Liquor Palace<br>3302 S. Dort Hwy                      | 3/4/2015    | 10:51 | 8.7                    | 0.604             | 7.83    | 130                                        | 70.5                             |
| #4                             | Taco Bell<br>3606 Corunna Rd.                          | 3/4/2015    | 11:13 | 4.8                    | 0.607             | 7.87    | 128                                        | 72.1                             |
| #5                             | University Market<br>2501 Flushing Rd.                 | 3/4/2015    | 11:28 | 3.5                    | 0.618             | 7.85    | 124                                        | 75.4                             |
| #6                             | Salem Housing<br>3216 MLK Blvd.                        | 3/4/2015    | 12:31 | 10.3                   | 0.573             | 7.95    | 116                                        | 65.7                             |
| #7                             | Rite-Aid<br>5018 Clio Rd.                              | 3/4/2015    | 12:46 | 8.1                    | 0.602             | 7.93    | 128                                        | 77.0                             |
| #8                             | N. Flint Automotive<br>6204 N. Saginaw St.             | 3/4/2015    | 13:05 | 12.8                   | 0.584             | 7.84    | 132                                        | 73.7                             |
| CS                             | Cedar Street Reservoir<br>& Pump Station               | 3/17/2015   | 10:45 | 7.8                    | 0.570             | 7.86    | 114                                        | 73.7                             |
| WS                             | West Side Reservoir<br>& Pump Station                  | 3/4/2015    | 11:49 | 1.9                    | 0.609             | 7.86    | 120                                        | 77.8                             |
| N/A                            | Russell Collection Agency<br>3285 Van Slyke Rd         | 3/6/2015    | 9:49  | 6.4                    | 0.540             | 7.69    | 110                                        | 81.0                             |
| N/A                            | Southwestern Academy<br>High School<br>1420 W.12th St. | 3/11/2015   | 11:08 | 19.7                   | 0.630             | 7.99    | 128                                        | 80.2                             |
| N/A                            | Cummings Elementary School<br>G-2200 Walton St.        | 3/11/2015   | 11:23 | 7.1                    | 0.569             | 7.81    | 128                                        | 83.4                             |
| N/A                            | Rite-Aid<br>3521 Corunna Rd.                           | 3/10/2015   | 11:10 | 8.4                    | 0.596             | 7.88    | 130                                        | 78.6                             |
| N/A                            | Clio Rd. Pharmacy<br>4902 Clio Rd.                     | 3/5/2015    | 11:55 | 7.7                    | 0.611             | 7.80    | 128                                        | 85.6                             |
| N/A                            | Tim Hortons<br>1274 Ballanger Hwy.                     | 3/5/2015    | 11:06 | 5.3                    | 0.620             | 7.76    | 124                                        | 82.6                             |
| N/A                            | Arby's<br>3559 S. Dort Hwy.                            | 3/5/2015    | 10:36 | 11.0                   | 0.629             | 7.80    | 130                                        | 83.4                             |
| N/A                            | Ya Ya's<br>519 S. Dort Hwy                             | 3/13/2015   | 10:31 | 14.8                   | 0.603             | 7.77    | 134                                        | 84.2                             |
| N/A                            | Taco Bell<br>1740 S. Dort Hwy                          | 3/13/2015   | 10:41 | 4.7                    | 0.586             | 7.77    | 134                                        | 84.2                             |
| N/A                            | Grandma's Recipe<br>3538 Richfield Rd.                 | 3/5/2015    | 9:45  | 6.5                    | 0.580             | 7.73    | 130                                        | 84.2                             |
| N/A                            | Flint City Hall<br>1101 S. Saginaw St.                 | 3/6/2015    | 10:33 | 14.1                   | 0.630             | 7.71    | 136                                        | 83.4                             |
| N/A                            | Quizzno's<br>3818 E. Court St.                         | 3/12/2015   | 11:03 | 7.9                    | 0.572             | 7.93    | 122                                        | 87.4                             |
| N/A                            | Whitehorse Tavern<br>621 W. Court St.                  | 3/6/2015    | 10:12 | 9.1                    | 0.634             | 7.60    | 134                                        | 84.2                             |
| N/A                            | Flint Public Library<br>1026 E. Kearsley Rd.           | 3/6/2015    | 10:56 | 20.7                   | 0.606             | 7.85    | 126                                        | 81.8                             |
| N/A                            | Rite-Aid<br>3717 Fenton Rd.                            | 3/10/2015   | 10:53 | 9.6                    | 0.623             | 7.84    | 126                                        | 75.4                             |

# Congressional & Legislative Mtg. 9/21/05

- Kildoe
- Ananich

Ann

- Stabenow office
- Peters office
- Gov. Office
- Ananich office

Kildoe

What help can be provided  
sig. problem w/ DW

- Floating Info
- Consistency in Govt. Approach

Multiple Things Going On

① DWQ

② - RWA impact?

③ - Realistic Options  
Fed Role

Peters & Stabenow No More



Anamsh Ques

- Med Issues

Mayor

- Multilevel Approach  
Clear Picture

① DWSD option

② Assessment

③ Long Term

④ Partnership



- ~~Con~~ Summ Notice

- CCR

## Dir. Summary

- EPA & DEQ

Mayer's Technical Advisor?  
Mayer DEQ & EPA set group?

- City's movement going fwd.

- Long Term Resource Need

- Lead Education

888 557-5811  
2753012

- Congressman Response

- Instead of written do briefly  
conversations

Friday or Monday

- Don Mtg. w/ Mott Foundation Wed. / Thurs.  
Mtg. tomorrow

FAQ  
Format

- Briefing responding to congressman &  
rep letter

①

② Mtg. w/ Director Wright

③ Mtg. w/ Gov Office  
DHHS Treasury

④ Conversation w/ legislature

4:00 Mtg.

call w/ Susan Heclamer

↳ Joint Response

Not Recommended

Wanted

Sample

Don't Supervise

135+ sample bottles  
sent to customers

→ 2014 Round

every sample  
called highest

- why not resampled

- Sampling pool decided

= 13 hours from initial pool

Understand Mr. Edwards has concerns about the law

Sampling pool created in 1991 33 sites as part of  
DWSO

lost ~~33~~ 2011 23 samples required

with over Tier 1 sites  
15,000

↓  
with change in source  
+ treatment increased to  
100 minimum

**Thelen, Mary Beth (DEQ)**

---

**From:** Sygo, Jim (DEQ)  
**Sent:** Wednesday, October 07, 2015 6:00 PM  
**To:** Thelen, Mary Beth (DEQ); Shaler, Karen (DEQ); Wyant, Dan (DEQ)  
**Subject:** Fwd: TAC Meeting Highlights

Summary of advisory committee meeting

Sent from my iPhone

Begin forwarded message:

**From:** "Prysby, Mike (DEQ)" <[PRYSBYM@michigan.gov](mailto:PRYSBYM@michigan.gov)>  
**Date:** October 7, 2015 at 4:56:44 PM EDT  
**To:** "Sygo, Jim (DEQ)" <[SygoJ@michigan.gov](mailto:SygoJ@michigan.gov)>  
**Subject:** TAC Meeting Highlights

Below is a summary of the Flint TAC meeting to obtain the committee's endorsement to switch back to Detroit water.

1. The TAC endorses the switch back to the DWSD
2. Marc Edwards of VA Tech supports the switchover to DWSD with conclusion that Flint River water with corrosion control will still be 4 times more corrosive than water from DWSD after 5 weeks of treatment.
3. Genesee County states two weeks to prepare pipeline for re-use (flush, disinfect, sample, etc)
4. Supplemental corrosion control still needed with DWSD water and ACT 399 submittal can be made in approx one week.
5. No pros were brought to the table for staying on the Flint River.

Sent from my iPhone

10 DAY EXT  
RW

www.freepress.com

# Detroit Free Press

160 W. FORT STREET DETROIT, MICHIGAN 48226

0045-16  
EXEC-RMO  
Lansing  
Due: 10-27-15

Brad Wurfel  
Public Information Officer  
Michigan Department of Environmental Quality

Oct. 5, 2015

Dear Mr. Wurfel:

This request is pursuant to the Michigan Freedom of Information Act (MCL 15.231 et. seq.).

Specifically, I request copies of the following public records:

- 1 • Records showing the results of the water quality tests conducted by or ordered by the Michigan Department of Environmental Quality or the City of Flint between Jan. 1, 2014 and Oct. 5, 2015,
- 2 • Any communications sent or received by DEQ director Dan Wyant related to Flint water quality between Jan. 1, 2014 and Oct. 5, 2015, *sent*
- 3 • Any communication or documents, electronic or otherwise, related to the U.S. Environmental Protection Agency memo or interim report from Miguel A. Del Toral dated June 24, 2015, *Flint*
- 4 • Any subsequent correspondences regarding lead levels in Flint city water between the city of Flint, the Michigan Department of Environmental Quality and the EPA and
- 5 • Any and all correspondences or documents, electronic or otherwise, related to the report "Analysis of the Flint River as a Permanent Water Supply for the City of Flint July 2011."

We intend to use this information for a newspaper story, so we ask that you please expedite this request. If portions of this request are available more quickly than others, we ask you to forward those portions immediately rather than wait until the entire request is completed. If the cost of this request is estimated to exceed \$50, I ask that you inform me of the estimated cost before completing this request so that I can decide whether to appeal the fee.

If you have any questions about this request, please contact either John Wisely or me. John can be reached at (313) 222-6825 or [jwisely@freepress.com](mailto:jwisely@freepress.com); I can most easily be reached by cell at (313) 222-2708 or by email at [rrrb@freepress.com](mailto:rrrb@freepress.com).

Thank you for your prompt attention. We look forward to your response.

Robin Erb and John Wisely  
Free Press Staff Writers

830-930

7/9/2015

6/24

EPAV

Flint

Sent



AAR Mtg.

12-17-2015

Gov Task Force

Rich Board

Dir Mtg

Longer than anticipated

Single point of contact on dashboard

↳ Harry Holman

↳ unknown

↳ community engagement

Then telling what was wrong

Flint → Statewide response

Flint → Strategic Water Fund

Vision for addressing statewide

Schools?

201 Program?

CWS Plan

Abstract?

Reverse Schedule for DWRF Prog Plan Application  
Error Program?

- KWA Mtg. by Mayer/Natasha

- DWRF contacts

- Harvey + Funding



Oct. 1, 2015

## **Michigan leaders to announce action plan for Flint drinking water**

**Friday, Oct. 2 at 1:30 p.m.**

Local, state and federal leaders will host a press conference to announce Gov. Rick Snyder's action plan for addressing drinking water concerns in Flint. Participants will include:

- Harvey Hollins, Director of the Office of Urban Initiatives for Gov. Rick Snyder
- Dan Wyant, Director for the Michigan Department of Environmental Quality
- Nick Lyon, Director for the Michigan Department of Health and Human Services
- Dr. Eden Wells, Chief Medical Executive for the Michigan Department of Health and Human Services
- Dayne Walling, Mayor of Flint
- Susan Hedman, Region 5 Administrator for the U.S. Environmental Protection Agency
- Name, Title for the Genesee County Health Department

Location:

Kettering University, Innovation Center

Corner of Bluff Street and Cottage Grove

Flint, MI 48504

**Media who plan to attend this event must RSVP by noon Friday.** Contact Karen Tommasulo at 517-599-5733 or [tommasulok@michigan.gov](mailto:tommasulok@michigan.gov).

Flint

## Flint City Council approves resolution to buy water from Karegnondi, state approval still needed



[<http://connectmlive.com/staff/dadams1/index.html>] By Dominic Adams | [dadams5@mlive.com](mailto:dadams5@mlive.com) [<http://connectmlive.com/staff/dadams1/posts.html>]  
Follow on Twitter [<http://www.twitter.com/dominicadams>]  
on March 25, 2013 at 10:45 PM, updated March 26, 2013 at 1:28 AM

FLINT, MI — Flint is one step closer to getting its water from Lake Huron as part of the Karegnondi Water Authority.

The vote, approved 7-1 at the Flint City Council meeting Monday, March 25

[[http://www.mlive.com/news/flint/index.ssf/2013/03/flint\\_city\\_council\\_again\\_delay.html](http://www.mlive.com/news/flint/index.ssf/2013/03/flint_city_council_again_delay.html)], may have set in motion the end to Flint paying to get its water from Detroit.

Under the proposal, Flint would get 16 million gallons per day of raw water from Lake Huron, pipe it to Flint for treatment and then sell it to customers throughout the city. Another 2 million gallons per day would come from the Flint River and will be treated in Flint.

Mayor Dayne Walling said the Department of Environmental Quality must approve Flint's getting 2 million gallons per day from the Flint River.

Tuesday's meeting followed weeks of discussions and special meetings surrounding the resolution.

"We got there," Councilman Joshua Freeman said. "That's the important thing."

There were more than 50 people at Monday's meeting.

"Going with Karegnondi is the best decision. We have no opinion on the economics of the decision," said Rebecca Fedewa, Flint River Watershed Coalition executive director. "If we start drawing water out of the Flint River, we are at risk of having to start releasing water from our reservoirs."

Genesee County Drain Commissioner Jeff Wright said the decision must still be approved by a county water and waste advisory board. The KWA board will then be reconvened for final approval.

Wright said construction could start in May.

State treasury officials still must approve the city council's move because Flint has an emergency financial manager. All expenditures over \$50,000 must be approved.

Genesee County Drain Commissioner Jeff Wright has said that Flint would pay roughly \$6.4 million annually for water service if it joined the pipeline — a nearly \$4 million savings on what it pays Detroit for water.

Walling previously said the city would save \$19 million over eight years

[[http://www.mlive.com/news/flint/index.ssf/2013/03/flint\\_city\\_council\\_delays\\_decl.html](http://www.mlive.com/news/flint/index.ssf/2013/03/flint_city_council_delays_decl.html)] by getting water from the KWA.

"It's a historic night in the City of Flint," Walling said. "The savings will be less with the capacity level approved by city council because there will be increased treatment cost for the river water."

He said the DEQ told the city it needed to get 18 million gallons per day or there would have to be additional work done at Flint's water plant.

Flint's water plant and the Flint River is currently the backup for Flint and Genesee County, however, the plant only operates four times per year.

Councilman Bryant Nolden was the lone dissenting vote.

"It was a protest vote," Nolden said. "I knew they had enough votes. I just feel like the Flint River is our best option."

Karegnondi is the regional water authority that includes Genesee, Lapeer and Sanilac counties and the cities of Flint and Lapeer.

Flint is the second municipality, behind Genesee County, to officially decide to purchase raw water through the KWA. Lapeer city officials said they intend to purchase water, but an agreement has been finalized.

Dominic Adams is a reporter for MLive-Flint Journal. Contact him at [dadams5@mlive.com](mailto:dadams5@mlive.com) or 810-241-8803. Follow him on Twitter [<http://www.twitter.com/dominicadams>], Facebook [<http://www.facebook.com/dominic.adams.1865>] or Google+ [<https://plus.google.com/103690672506808729911?rel=author>].



## Related Stories



Price of Detroit water for Flint is \$1.5 million a month, mayor says

[[http://www.mlive.com/news/flint/index.ssf/2015/10/mayor\\_city\\_ad](http://www.mlive.com/news/flint/index.ssf/2015/10/mayor_city_ad)]



Here's how that toxic lead gets into Flint water

[[http://www.mlive.com/news/flint/index.ssf/2015/10/see\\_step\\_by\\_s](http://www.mlive.com/news/flint/index.ssf/2015/10/see_step_by_s)]

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## GENESEE COUNTY DRAIN COMMISSIONER'S OFFICE

JEFFREY WRIGHT

COMMISSIONER

G-4608 BEECHER ROAD, FLINT, MI 48532  
PHONE (810) 732-1590 FAX (810) 732-1474



FOR IMMEDIATE RELEASE

CONTACT: Jeff Wright

March 26, 2013

810-287-1925

**What:** Jeff Wright Statement on Flint City Council Approving Resolution to Join KWA.

**When:** March 26, 2013

**Additional Info:** Jeff Wright, CEO of the KWA, today praised the Flint City Council for voting to approve a resolution to officially have the City of Flint join the KWA and its' water line.

"I have said from the beginning that this decision must be made by Flint's City Council and Mayor," said Wright. "I appreciate the council voting the way they did, but even more than that, I am glad the residents of Flint were able to have their voices heard via their elected officials." The next step in the process will come with the KWA Board executing the contract for the City.

"The most important aspect from the vote is the fact that we as an Authority can move forward knowing Flint's intentions," said Wright.

Despite Emergency Manager Ed Kurtz publicly supporting the project, Wright had made a vote by council a condition of Flint joining the KWA so the residents would have their say.

"There is a basic tenet that government is best when it has local control. We saw that with the council vote. Nobody, whether they live in Flint, Grand Blanc, Davison, Fenton, or anywhere in Genesee County, should have these types of decisions made by people who live outside of their community," said Wright.

At the next Water and Waste Advisory Board meeting a vote will be taken to award a contract for construction of the intake portion of the water line. All bids were submitted to the board at their last meeting for review.



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF TREASURY  
LANSING

ANDY DILLON  
STATE TREASURER

Mr. Edward Kurtz  
Emergency Manager  
City of Flint  
1101 South Saginaw Street  
Flint, MI 48502

April 11, 2013

Dear Mr. Kurtz:

Thank you for your March 29, 2013 letter, which is attached for reference. As the Emergency Manager for the City of Flint ("Flint" or "City"), you have asked for my concurrence, pursuant to Public Act 436 of 2012, the Local Financial Stability and Choice Act, to authorize a contract in excess of \$50,000.00 not subject to competitive bidding. This request was related to the City entering into an agreement with the Karegnondi Water Authority (KWA) for provision of raw water for the City.

In considering your request, I took note of the following facts in support of Flint joining KWA. First, there is widespread support in the City for this move, including the support of the Mayor, the City Council, and the Emergency Manager. Second, this move will provide a unique opportunity for the City and County to partner on an important project, which will hopefully lead to future regional collaboration. Third, the Department of Environmental Quality is supportive of the City participating in the KWA project. Finally, your representations that this deal will lead to substantial savings for the City over the coming decades, savings that are desperately needed to help with the turnaround of the City of Flint.

It is my understanding that the Detroit Water and Sewer Department is making a final best offer to Genesee County and the City of Flint next Monday, April 15, 2013. As such, this approval will be effective at 5 pm on April 16, 2013 after receiving written notice from the City that either no such offer was presented to the county and the City or that an offer was received and was rejected in good faith based upon specified objections.

For the reasons described above and subject to the conditions set forth herein, pursuant to Section 12 (3) of PA 436 of 2012, I am authorizing you to proceed with adopting the resolution and entering into a contract with KWA.

Sincerely,

  
Andy Dillon  
State Treasurer

Flint

# Flint council supports buying water from Lake Huron through KWA



[<http://connect.mlive.com/staff/dadams1/index.html>] By Dominic Adams | [dadams5@mlive.com](mailto:dadams5@mlive.com) [<http://connect.mlive.com/staff/dadams1/posts.html>]  
Follow on Twitter [<http://www.twitter.com/dominicadams>]  
on March 25, 2013 at 7:17 PM, updated March 26, 2013 at 7:43 AM

FLINT, MI -- Flint residents may soon get their water from Lake Huron.

The Flint City Council voted 7-1 to get 16 million gallons per day from the Karegnondi Water Authority.

"This is about compromise," said Councilman Sheldon Neeley.

Neeley got support from Councilman Joshua Freeman, after the two were previously at odds about the amount the city should withdraw from Lake Huron.

Councilman Bryant Nolden was the lone "no" vote.

"It was a protest vote," Nolden said. "I just feel like the Flint River is our best option."

Genesee County Drain Commissioner said construction of the pipeline could start in May.

The city currently pays to get its water from Detroit.

State treasury officials still must approve the city council's move because Flint has an emergency financial manager. All expenditures over \$50,000 must be approved.

*Dominic Adams is a reporter for MLive-Flint Journal. Contact him at [dadams5@mlive.com](mailto:dadams5@mlive.com) or 810-241-8803. Follow him on Twitter [<http://www.twitter.com/dominicadams>], Facebook [<http://www.facebook.com/dominic.adams.1865>] or Google+ [<https://plus.google.com/103690672506808729911?rel=author>].*

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Former Detroit American Motors Corp. headquarters being auctioned; starting bid \$500

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# Flint Mtg @

- Wayne Workman

- Dave Murray

- Al Harris

- Rusty Austin

- Clarence Demery Debrae Task Force

walters313@gmail.com

- Samples from city collected in accordance w/ Rule check w/ city

- Lead exposure is immediate

- Water Rate Restructure

- Rule 710a(1)

to DEO Notification 3 months from the end of the monitoring period to consume

30 days to customer

# Sample History 212

Rusty Water - Complaint

① Collection Date 2/11/2015 Cu, Fe, Mn, Zn (no lead analysis)  
only  
by city 10:20 AM

② 2/18/2015 Pb 104 ppb But Filtered  
Cu ND  
by Walters 7:15 AM Form? ✓

③ 2/25/2015 Metals (lead ND)  
by city 10:26 AM

④ 3/3/2015 Pb 397 ppb  
by Walters 6:00 AM Form? Cu ND

⑤ 3/18/2015 Pb 4 ppb  
by city 11:10 AM Cu ND

⑥ 4/2/2015 Service Line Improper Tap  
by Walters



CCR1

Mailed out on air w/ VN  
7/15 of July

212 Browning

Didn't Pay for several months

Charge for - Service Replaced? City Pays

- Analysis? City Pays

- other water use? No major use

- Plumbing Permit? Check w/ inspector

EPA did not provide copies of results

Not certified

| Monitoring Period | 90 <sup>th</sup> %ile | Samples Above 15 ppb | Total       |
|-------------------|-----------------------|----------------------|-------------|
| 1-6/2015          | 11 ppb                | 6                    | (68 total)  |
| 6-12/2014         | 6 ppb                 | 2                    | (100 total) |
| 6-9/2011          | 0 ppb                 | 0                    | (23 total)  |
| 6-9/2008          | 0 <del>2.5</del> ppb  | 0                    | (33 total)  |
| 6-9/2005          | 1.4 ppb               | 0                    | (33 total)  |
| 6-9/2002          | 4 ppb                 | 1                    | (33 total)  |
| 6-9/2001          | 4.4 ppb               | 0                    | (33 total)  |
| 6-9/2000          | 7 ppb                 | 2                    | (33 total)  |
| 1-6/1999          | 5 ppb                 | 0                    | (33 total)  |
| 7-12/1998         | 7.4 ppb               | 1                    | (33 total)  |
| 7-12/1997         | 5 ppb                 | 1                    | (33 total)  |
| 1-6/1997          | 4.5 ppb               | 1                    | (33 total)  |
| 7-12/1992         | 14.4 ppb              | 3                    | (33 total)  |
| 1-6/1992          | 15 ppb                | 4                    | (33 total)  |

No Monitoring Required  
til 1997

3/15/1993/dhr  
DWSI in 1992  
Study to 7/1/1994

Treatment by 1/1/1997



## Busch, Stephen (DEQ)

---

**From:** Shekter Smith, Liane (DEQ)  
**Sent:** Thursday, March 19, 2015 3:30 PM  
**To:** Sygo, Jim (DEQ); Wurfel, Brad (DEQ)  
**Cc:** Benzie, Richard (DEQ); Busch, Stephen (DEQ)  
**Subject:** FW: Information Request and Documentation

Please see the note below.

Has there been any further communication with or from DCH?

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Thursday, March 19, 2015 3:05 PM  
**To:** Benzie, Richard (DEQ); Prysby, Mike (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** FW: Information Request and Documentation

Response from Jim Henry below.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

---

**From:** Henry, James [<mailto:jhenry@gchd.us>]  
**Sent:** Thursday, March 19, 2015 12:15 PM  
**To:** Busch, Stephen (DEQ)  
**Cc:** Valacak, Mark; Cupal, Suzanne  
**Subject:** RE: Information Request and Documentation

Hello Mr. Busch,

Thanks for your response. I'm looking forward to working with your office moving forward. Based upon my experiences with this investigation, I think it is necessary for my communications to be candid and followed up in writing whenever possible. Our goal is to successfully conduct this investigation in efforts to better protect the public.

I agree there are ambiguities written in the FOIA request. GCHD does not have municipal water system expertise and we are continuously learning about the processes. The FOIA request is specific enough that we should have received a timely response from the City of Flint. Also, it is addressed to the City and I apologize if there were misunderstandings regarding the intended recipient.

There have not been any conclusions regarding the source of illnesses. Our team is gathering information and we suspect there may be several sources. It has been made clear that the Flint municipal water system is in compliance with the Safe Drinking Water Act. It seems reasonable that your office would be involved regardless if a potential health risk from municipal water is related to consumption, inhalation or dermal exposure. Perhaps the legislation should be revisited to better address risks.

As you mentioned, we had communications with your office in October 2014, regarding Legionella, but I also had three telephone conversations with Mr. Michael Prysby, from your office between January 21, 2015 and January 23, 2015. These conversations occurred around the same time that your office participated with the TTHM presentation in Flint. I "explicitly explained" the details of the Legionella concerns and the possible associations with the Flint municipal water system and I specifically requested to meet with your office for further discussions.

Mr. Prysby informed me that the concerns were discussed with you. I was informed there was no reason to meet because the municipal water system is in compliance with the Safe Drinking Water Act. Other than the timeframes written in your email, you are correct, I did not contact your office again until the email, dated March, 10, 2015.

GCHD has been working closely with MDCH and has consulted with CDC on several occasions regarding the epidemiological investigation. Also, we have been working with Legionella and municipal water experts, and recently with the USEPA. Based upon these discussions we have been informed that it is likely that a small amount of Legionella will survive the water treatment process at the plant and enter into the distribution system.

Our team is in the process of developing plans, which may include sampling locations within the distribution system and comparing environmental and clinical isolates. We recognize potential social, political and economic impacts regarding this investigation and need to be prepared for all outcomes. Hopefully, your office, the regulatory agency, will be available for assistance.

If a representative from your office is available to meet next week, please respond with some dates and times. I think it would be appropriate for the City to attend meetings and I will contact Mr. Croft, Flint DPW Director, after I receive a response from your office.

Thank you

Jim

Jim Henry  
Jim Henry RS, MBA  
Environmental Health Supervisor  
Genesee County Health Department [www.gchd.us](http://www.gchd.us)  
630 S. Saginaw St., Suite 4  
Flint, MI 48502-1540  
Phone (810) 257-3618 Fax (810) 257-3125  
E-mail [jhenry@gchd.us](mailto:jhenry@gchd.us)



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For a copy of the Health Department's Notice of Information Practices, contact the Health Department or visit the Health Department's website at <http://www.gchd.us/>

**From:** Busch, Stephen (DEQ) [<mailto:BUSCHS@michigan.gov>]  
**Sent:** Friday, March 13, 2015 3:47 PM  
**To:** Henry, James  
**Cc:** Prysby, Mike (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** RE: Information Request and Documentation

Mr. Henry,

The January 27, 2015, FOIA request you provided was directed to the City of Flint, not the DEQ. The DEQ has no record of a FOIA request from your office for such information. It is our understanding that the City has responded to your FOIA request, has helped you adequately redefine your request within the City's scope of public record to address such ambiguities as "any additional areas of concern", and provided you with additional information beyond the scope of your request.

The DEQ fully recognizes the public health threat posed to individuals that contract Legionnaires' Disease with the understanding that the disease is not contracted by ingestion of potable water and therefore not regulated under the federal Safe Drinking Water Act. Your email below claims that you have explicitly explained the situation to our Department. However, since contacting our office early last October to indicate a rise in cases, we have not received any further information regarding your epidemiological investigation into this matter.

Further, conclusions that legionella is coming from the public water system without the presentation of any substantiating evidence from your epidemiologic investigation appears premature and prejudice toward that end.

It is highly unlikely that legionella would be present in treated water coming from the City of Flint water treatment plant given the treatment plant's use of ozone along with complete treatment and chlorine disinfect contact time to comply with federal surface water treatment rules for potable water. Detections of total coliform or heterotrophic bacteria in the City's public water distribution system indicate an environment where bacterial growth may be supported. However, there is no direct correlation that can be made to the presence of legionella. While total organic carbon levels in potable water may serve as a food source for bacteria growth in private plumbing system, water temperatures in the City's distribution system are below legionella growth range, and chlorine residual levels would also limit such growth.

Our office agrees that water main breaks, water leaks, and system repairs are possible vectors for legionella to enter the public water system. These should be investigated as part of your epidemiology. DEQ staff can be made available to assist GCHD and the City regarding such matters, but to date no request by GCHD for any such meeting has been received, let alone declined as alleged in your email.

If GCHD is seeking assistance to complete its epidemiological investigation regarding this matter, such resource requests should be directed to the Michigan Department of Community Health. Our Office agrees that a multi-agency partnership would be beneficial to move forward and develop a unified response. In that respect, if our Office can be of any further assistance you may contact me directly.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

**From:** "Henry, James" <[jhenry@gchd.us](mailto:jhenry@gchd.us)>  
**Date:** March 10, 2015 at 6:40:17 PM EDT  
**To:** Howard Croft <[hcroft@cityofflint.com](mailto:hcroft@cityofflint.com)>, "Mike Prysby (DEQ)"

<prysbym@michigan.gov>, Elizabeth Murphy <emurphy@cityofflint.com>, "Natasha Henderson" <nhenderson@cityofflint.com>, Jerry Ambrose <gambrose49@gmail.com>, Dayne Walling <dwalling@cityofflint.com>  
**Cc:** "Valacak, Mark" <MVALACAK@gchd.us>, "Cupal, Suzanne" <scupal@gchd.us>, "Hasan, Shurooq" <shasan@gchd.us>, "Childs, Bonnie" <BCHILDS@gchd.us>, "Hallwood, Dawn" <dhallwood@gchd.us>, "Johnson, M.D., Gary" <GJOHNSON@gchd.us>

**Subject: Information Request and Documentation**

Hello everyone,

The Genesee County Health Department has made several written and verbal requests for specific information since October, 2014, including a Freedom of Information Act Request on January 27, 2015. The information still has not been received and the city's lack of cooperation continues to prevent my office from performing our responsibilities.

The Genesee County Health Department has the responsibility to conduct illness investigations and consider all potential sources, this is not optional. In 2014, Genesee County experienced a significant increase of confirmed Legionella illnesses relative to previous years. Legionella can be a deadly, waterborne disease that typically affects the respiratory system.

The increase of the illnesses closely corresponds with the timeframe of the switch to Flint River water. The majority of the cases reside or have an association with the city. Also, McLaren Hospital identified and mitigated Legionella in their water system. This is rather glaring information and it needs to be looked into now, prior to the warmer summer months when Legionella is at its peak and we are potentially faced with a crisis.

This situation has been explicitly explained to MDEQ and many of the city's officials. I want to make sure, in writing that there are no misunderstandings regarding this significant and urgent public health issue. The Trihalomethane issues "pale in comparison" to the potential public health risks of Legionella.

I am submitting the attached FOIA request again and requesting that the legal obligations of the request are met. If the information is not available, please let me know. In the past, I have requested to meet with the water plant staff and MDEQ regarding Legionella concerns. I did not receive a response from the water plant staff and MDEQ declined. I think it is in the best interest for all stakeholders that we meet and discuss the issues.

Respectfully,

Jim

**Jim Henry**

Jim Henry RS, MBA

Environmental Health Supervisor

Genesee County Health Department [www.gchd.us](http://www.gchd.us)

630 S. Saginaw St., Suite 4

Flint, MI 48502-1540

Phone (810) 257-3618 Fax (810) 257-3125

E-mail [jhenry@gchd.us](mailto:jhenry@gchd.us)

7/21/2015

EPA

Tom

Rita

Nick

Tinka

D. & 4 focus on facts

Talked w/ Carrie Monson

①

Study allowance is 18 months  
if they make recommendation

Study River Now

Study new source

EPA Small System



Honored Conf, City of Detroit

3/13/2015

11:48 AM

FOIA  
SPH -

- WTP
- Service Center
- DPW

- Ambiguous

Not in Document Form

- Had Conf. Call ~~to~~ to narrow scope

= Did Respond

- Agency sent more info yesterday

- Have been working through legal

FOIA to City  
Inclusion of Mike Pryby/DEQ

Understand City has responded

Our Department is

While we were informed that <sup>back in</sup> GCHD was investigating <sup>IV</sup> cases you have yet to provide any epidemiologic conclusions in the (7?) months since that time

- Deliverable

- We can't recommend/endorse product

- Review submitted similar to WTP

→ - Vestia recommend?

- Ultra / RO Filter

- NSF

- UL

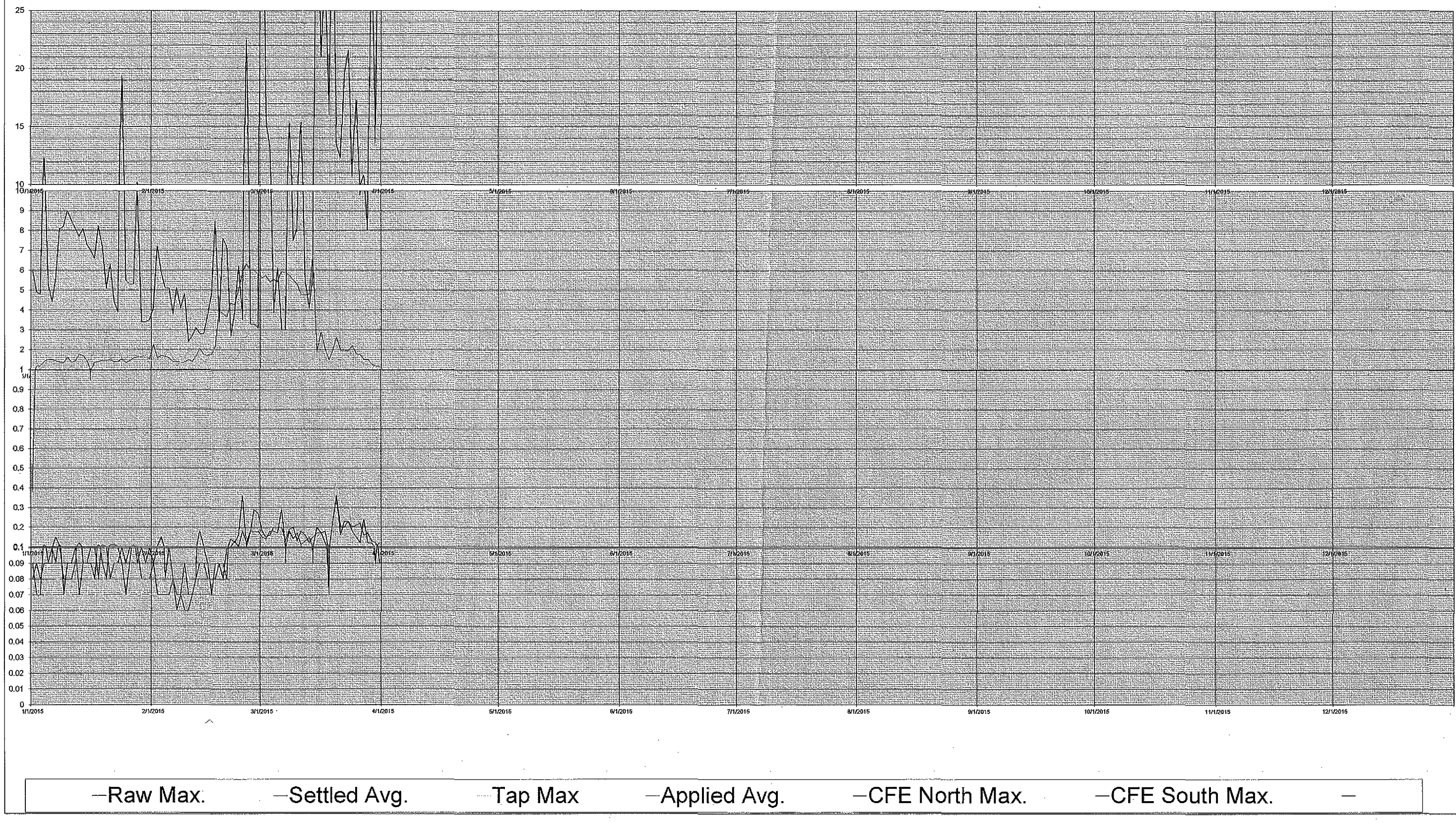
- WQA

-

} Not going to meet deliverable

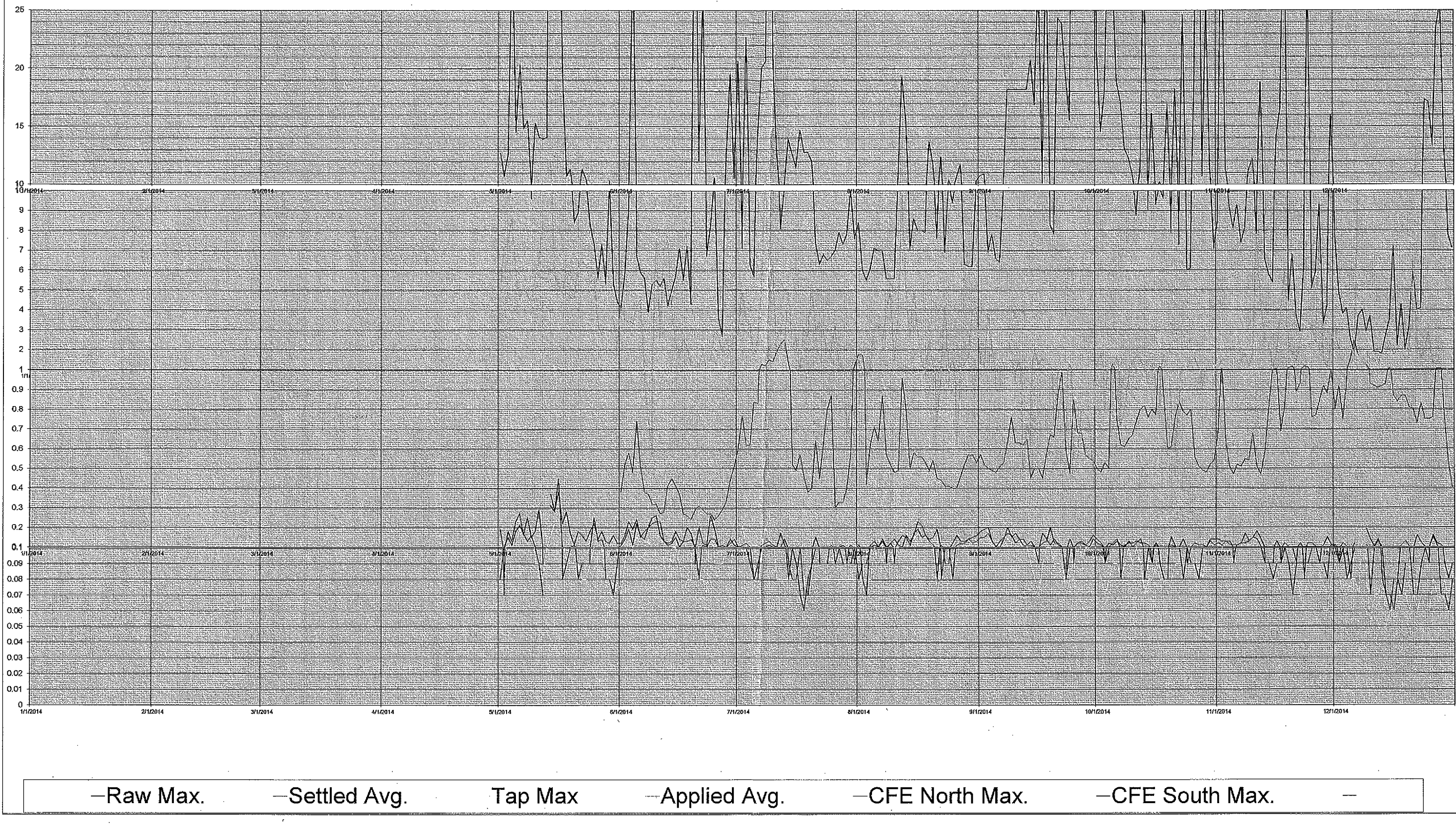


# Flint WTP 2015 Turbidity Comparison



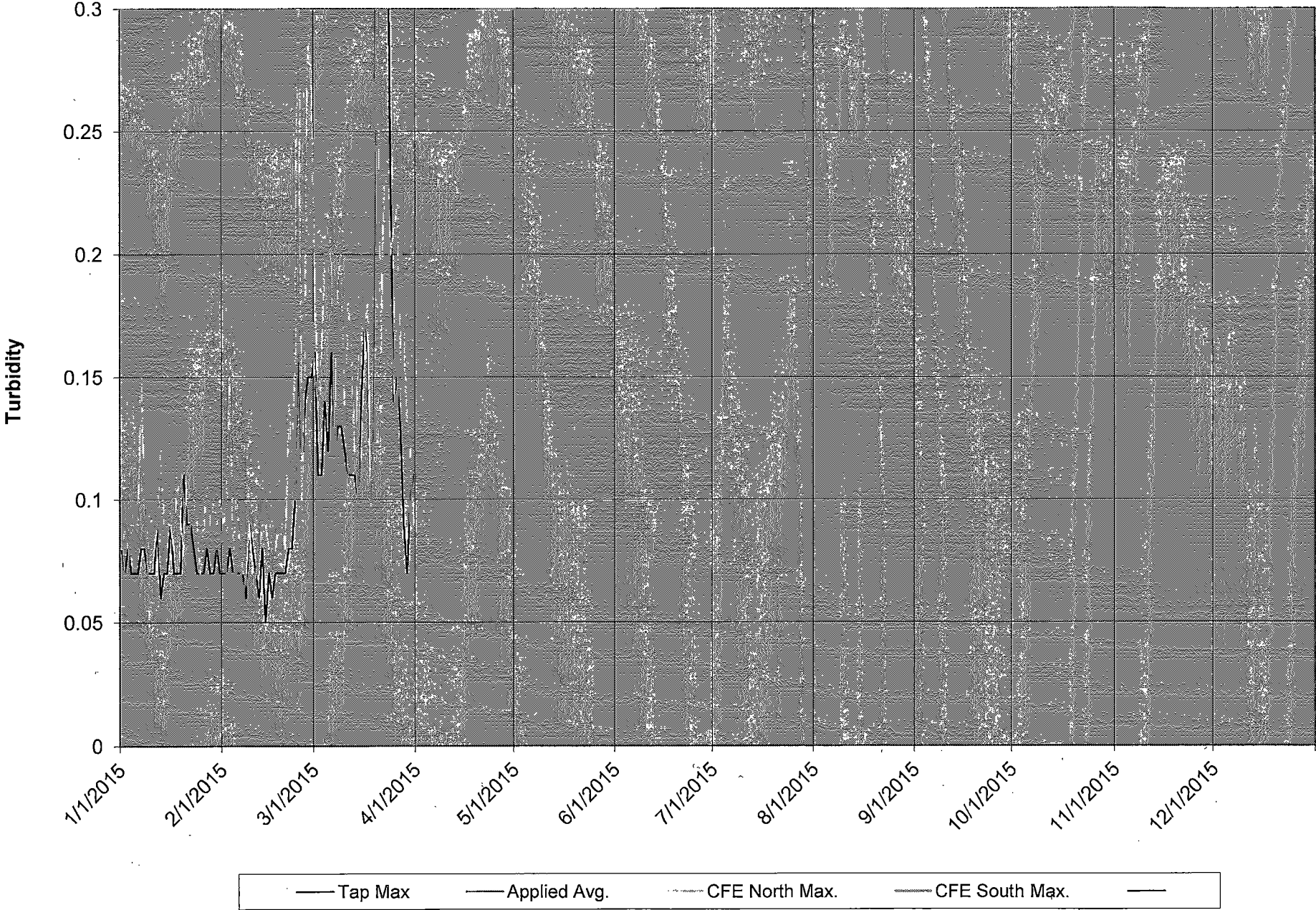


# Flint WTP 2014 Turbidity Comparison





Flint WTP 2015 Finished Water Turbidity



|           | Average Filter Run (Hours) |       |      |      |      |      |      |      |      |      |      | Overall      |
|-----------|----------------------------|-------|------|------|------|------|------|------|------|------|------|--------------|
|           | 2014                       | 2015  | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | Monthly Avg. |
| January   | 101                        | 76    |      |      |      |      |      |      |      |      |      | 76.00        |
| February  |                            | 86    |      |      |      |      |      |      |      |      |      | 86.00        |
| March     |                            |       |      |      |      |      |      |      |      |      |      | #DIV/0!      |
| April     |                            |       |      |      |      |      |      |      |      |      |      | #DIV/0!      |
| May       |                            |       |      |      |      |      |      |      |      |      |      | 101.00       |
| June      |                            |       |      |      |      |      |      |      |      |      |      | 74.00        |
| July      |                            |       |      |      |      |      |      |      |      |      |      | 65.00        |
| August    |                            |       |      |      |      |      |      |      |      |      |      | 78.00        |
| September |                            |       |      |      |      |      |      |      |      |      |      | 97.00        |
| October   |                            |       |      |      |      |      |      |      |      |      |      | 84.00        |
| November  |                            |       |      |      |      |      |      |      |      |      |      | 76.00        |
| December  |                            |       |      |      |      |      |      |      |      |      |      | 74.00        |
| Maximum   | 101                        | 86    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |              |
| Minimum   | 65                         | 76    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |              |
| Average   | 54.44                      | 13.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |              |

|              |      |      |       |
|--------------|------|------|-------|
| OVERALL AVG. | 6.14 | 0.00 | 13.50 |
| OVERALL MAX. | 101  | 0    | 101   |
| OVERALL MIN. | 0    | 0    | 0     |

| Average Percentage Wash Water Use |       |       |       |       |       |       |       |       |       |       | Overall |              |
|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|--------------|
|                                   | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  | 2022  | 2023  | 2024    | Monthly Avg. |
| January                           |       | 3.20% |       |       |       |       |       |       |       |       |         | 3.20%        |
| February                          |       | 2.40% |       |       |       |       |       |       |       |       |         | 2.40%        |
| March                             |       |       |       |       |       |       |       |       |       |       |         | #DIV/0!      |
| April                             |       |       |       |       |       |       |       |       |       |       |         | #DIV/0!      |
| May                               | 2.00% |       |       |       |       |       |       |       |       |       |         | 2.00%        |
| June                              | 3.60% |       |       |       |       |       |       |       |       |       |         | 3.60%        |
| July                              | 2.50% |       |       |       |       |       |       |       |       |       |         | 2.50%        |
| August                            | 2.80% |       |       |       |       |       |       |       |       |       |         | 2.80%        |
| September                         | 1.90% |       |       |       |       |       |       |       |       |       |         | 1.90%        |
| October                           | 2.70% |       |       |       |       |       |       |       |       |       |         | 2.70%        |
| November                          | 3.20% |       |       |       |       |       |       |       |       |       |         | 3.20%        |
| December                          | 2.90% |       |       |       |       |       |       |       |       |       |         | 2.90%        |
| Average                           | 1.81% | 0.46% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00%   |              |

|              |       |
|--------------|-------|
| OVERALL AVG. | 0.21% |
|              | 0.45% |
|              | 0.00% |

Flint 2015 Sanitary Survey Filter Data

|           | Maximum Filtration Rate Experienced (gpm/ft <sup>2</sup> ) |      |      |      |      |      |      |      |      |      |      | Overall<br>Monthly Avg. |
|-----------|------------------------------------------------------------|------|------|------|------|------|------|------|------|------|------|-------------------------|
|           | 2014                                                       | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |                         |
| January   |                                                            | 3.6  |      |      |      |      |      |      |      |      |      | 3.60                    |
| February  |                                                            | 3.3  |      |      |      |      |      |      |      |      |      | 3.30                    |
| March     |                                                            |      |      |      |      |      |      |      |      |      |      | #DIV/0!                 |
| April     |                                                            |      |      |      |      |      |      |      |      |      |      | #DIV/0!                 |
| May       | 3.8                                                        |      |      |      |      |      |      |      |      |      |      | 3.80                    |
| June      | 3.5                                                        |      |      |      |      |      |      |      |      |      |      | 3.50                    |
| July      | 3.8                                                        |      |      |      |      |      |      |      |      |      |      | 3.80                    |
| August    | 3.3                                                        |      |      |      |      |      |      |      |      |      |      | 3.30                    |
| September | 3.4                                                        |      |      |      |      |      |      |      |      |      |      | 3.40                    |
| October   | 3.3                                                        |      |      |      |      |      |      |      |      |      |      | 3.30                    |
| November  | 3.2                                                        |      |      |      |      |      |      |      |      |      |      | 3.20                    |
| December  | 3.2                                                        |      |      |      |      |      |      |      |      |      |      | 3.20                    |
| Maximum   | 3.8                                                        | 3.60 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |                         |

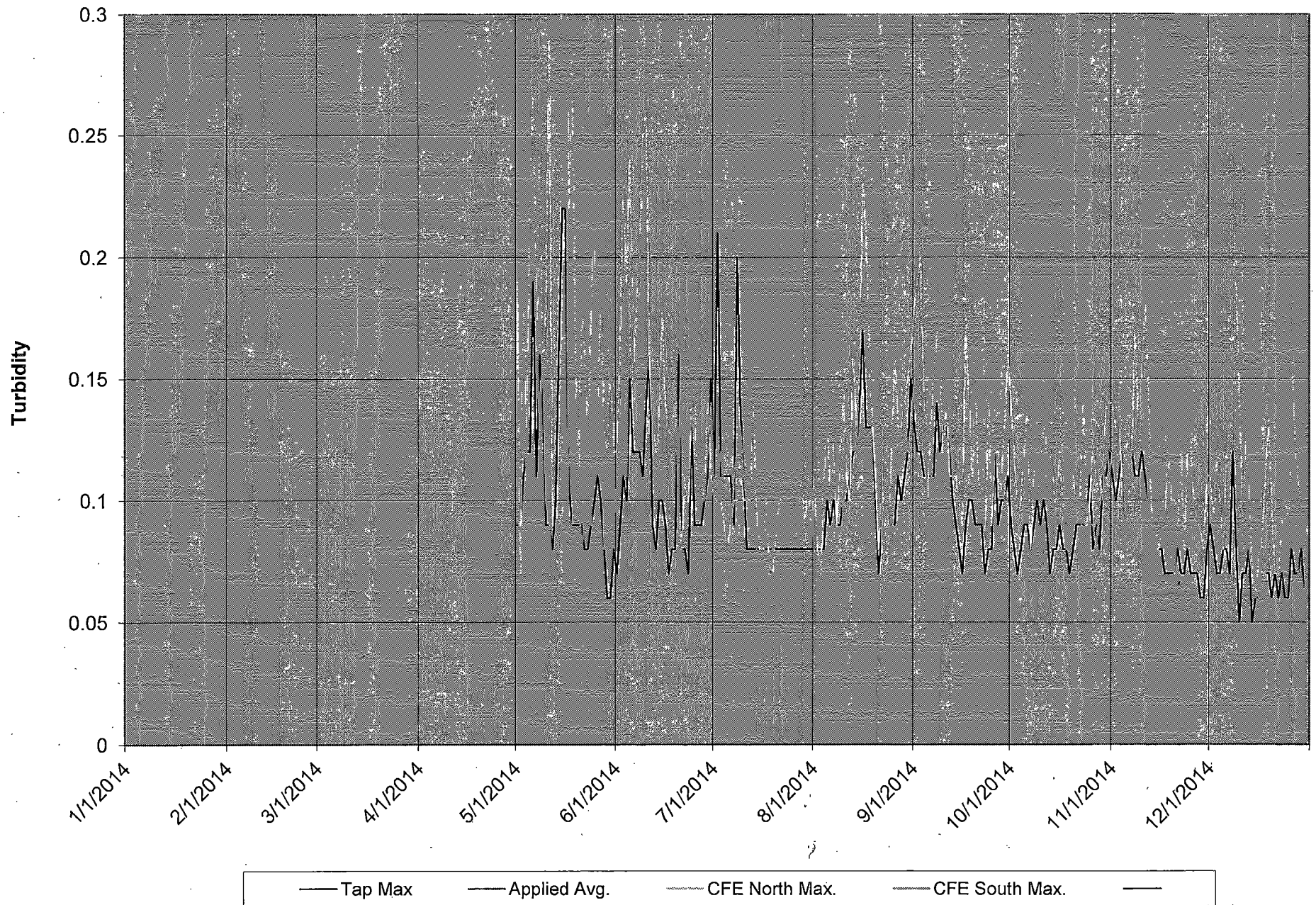
|                     |             |
|---------------------|-------------|
| <b>OVERALL MAX.</b> | <b>3.8</b>  |
|                     | <b>3.80</b> |
|                     | <b>0.00</b> |

|           | Average Filtration Rate (gpm/ft <sup>2</sup> ) |      |      |      |      |      |      |      |      |      |      | Overall<br>Monthly Avg. |
|-----------|------------------------------------------------|------|------|------|------|------|------|------|------|------|------|-------------------------|
|           | 2014                                           | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |                         |
| January   |                                                | 2.1  |      |      |      |      |      |      |      |      |      | 2.10                    |
| February  |                                                | 2.4  |      |      |      |      |      |      |      |      |      | 2.40                    |
| March     |                                                |      |      |      |      |      |      |      |      |      |      | #DIV/0!                 |
| April     |                                                |      |      |      |      |      |      |      |      |      |      | #DIV/0!                 |
| May       | 2.6                                            |      |      |      |      |      |      |      |      |      |      | 2.60                    |
| June      | 2.5                                            |      |      |      |      |      |      |      |      |      |      | 2.50                    |
| July      | 2.3                                            |      |      |      |      |      |      |      |      |      |      | 2.30                    |
| August    | 2.2                                            |      |      |      |      |      |      |      |      |      |      | 2.20                    |
| September | 2.1                                            |      |      |      |      |      |      |      |      |      |      | 2.10                    |
| October   | 1.9                                            |      |      |      |      |      |      |      |      |      |      | 1.90                    |
| November  | 2.1                                            |      |      |      |      |      |      |      |      |      |      | 2.10                    |
| December  | 2.4                                            |      |      |      |      |      |      |      |      |      |      | 2.40                    |
| Average   | 1.52                                           | 0.36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |                         |

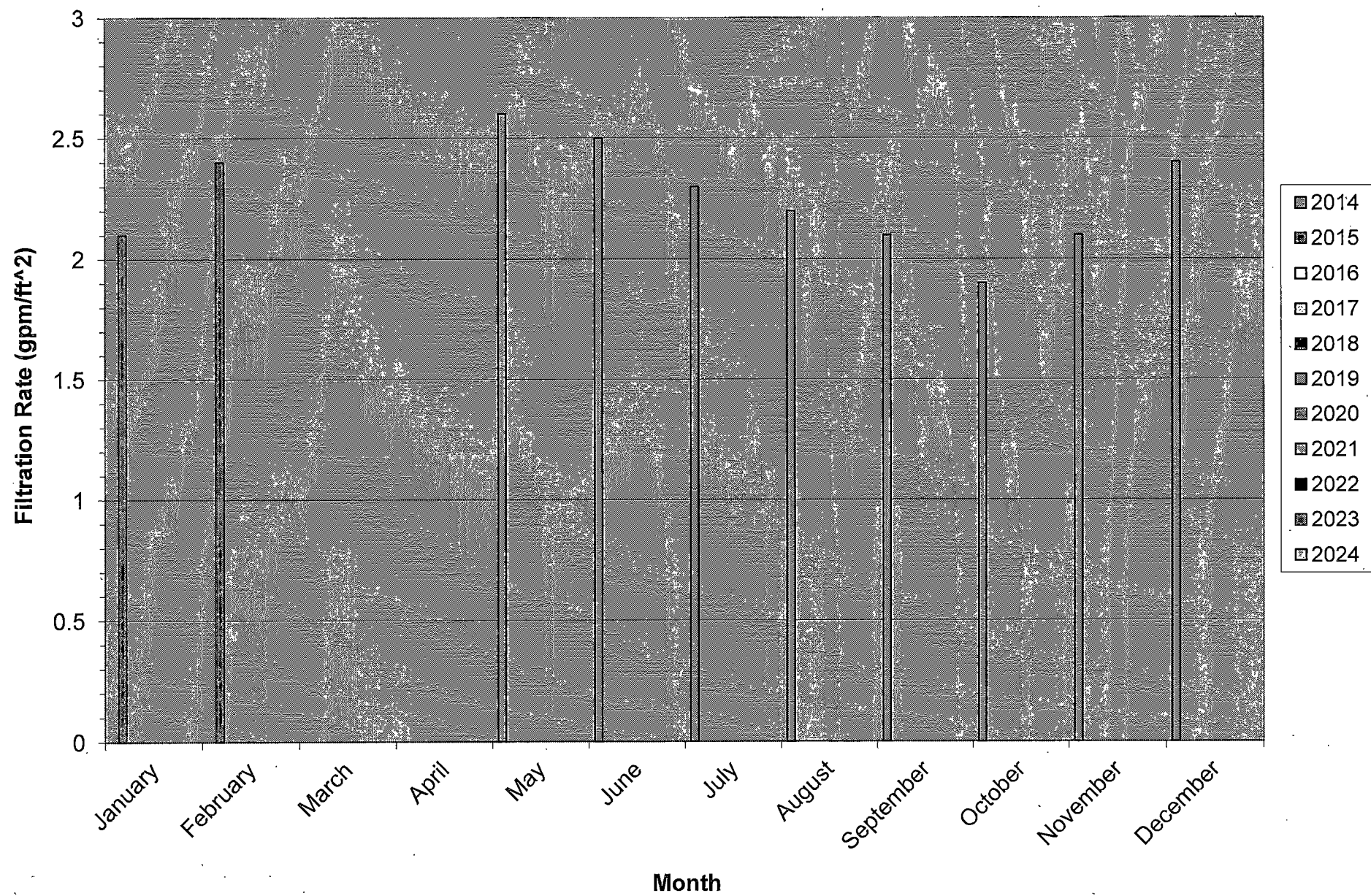
|                     |             |
|---------------------|-------------|
| <b>OVERALL AVG.</b> | <b>0.17</b> |
|                     | <b>0.38</b> |
|                     | <b>0.00</b> |



# Flint WTP 2014 Finished Water Turbidity

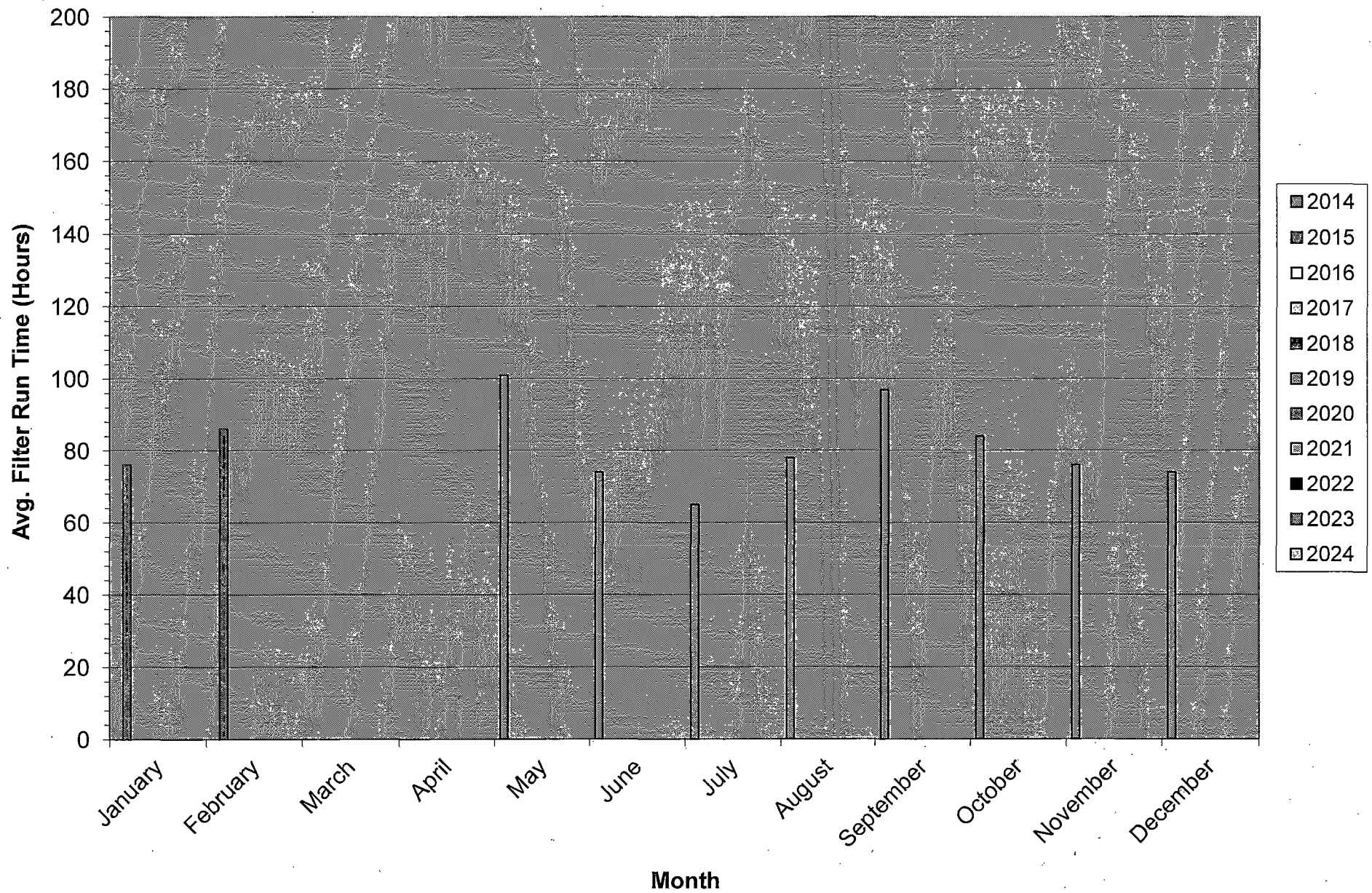


### Average Filtration Rate Monthly Comparison

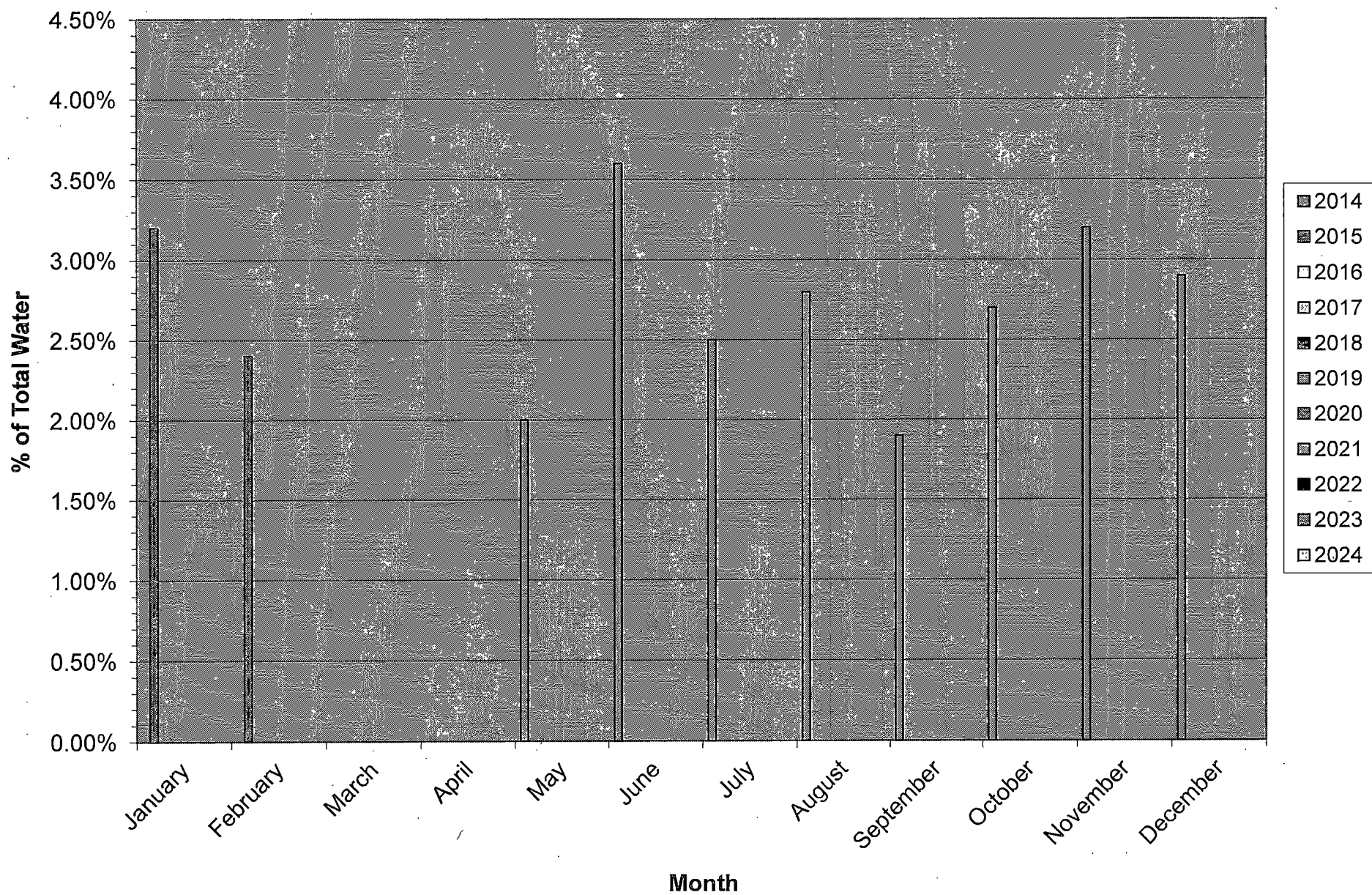




## Average Filter Run Hours Monthly Comparison



## Average Washwater Use Monthly Comparison



10/8/2015

Mott

Press Conf.

Gov.



10/6 or 10/7?  
Gov Meeting w/ Mayor others  
Announcement tomorrow  
data out tomorrow

↳ Messaging of data implications

Schools + indiv.  
test data  
what did we find  
where from  
just screening

protocol  
+ extra

- interim approach  
15 unless other data

5:00

State Resources

(1) Water Filters

(2) 1/2 of DWSD

(3) testing

(4) boots on ground staff/hungry resources  
multi dept

6:00

remediation not state responsibility

School admin

local utility → DWRF funds

IV problem

Schools outside Flint → state/fed is  
local cost. available

10/7/2015

Advisory Tonight

## Event Plan

3 rooms on ground floor of Matt Foundation

Rebuttal

Gov → Mayor

945-10 Speakers

Harvey MC

4 min for remarks

Mayor

Dean Wright

Lynne

Dr. Wells

Matt Foundation

10 Min Q+A

Gov out

Dir. 1 on 1 interviews:

Media + 20 people in room

WM Flint Chandler

- Ruston III (3)

- Annunzio, Kilder, Phelps, Neely

- Natasha, Howard Cott

- United Way Director

- Hurley Dr?

Gov - Collaboration

George

Mayor - Importance

DER - Next steps + When - DWSD

HIS - Incident - Process  
- Flat to

Wells - Results

Mott - Contribution  
\$4M

② Materials  
- Press Release  
- ?

2013 7-1 council to KWA

→ Early switched to Flat River on own



## DWSD Switch Logistics

Next steps

- ~~ECT~~
- DWSD
- + changeover (2 weeks)

Given 4 pts

To Gov.

1 - Budget

2 - ~~Call list~~

3 - 1 pgs. School Results

4 - Reg History

5 - Response to CC Ques

⑥ TAC Summary

| ALTERN | NAME           | ProjectName                                                                   | ReceivedDate | AdminComplete | IssuedDate |
|--------|----------------|-------------------------------------------------------------------------------|--------------|---------------|------------|
| 02310  | FLINT, CITY OF | Flint WTP Phase II, Seg. 1, 2 & 3                                             | 4/8/2014     | 4/9/2014      | 4/9/2014   |
| 02310  | FLINT, CITY OF | Flint WTP Phase II, Seg II-Lime Residual Disposal                             | 4/8/2014     | 4/9/2014      | 4/9/2014   |
| 02310  | FLINT, CITY OF | 24-inch Water Main Replacement                                                | 10/10/2012   | 3/18/2013     | 3/18/2013  |
| 02310  | FLINT, CITY OF | Torrey Road Booster Station Improvements                                      | 10/19/2012   | 11/2/2012     | 11/2/2012  |
| 02310  | FLINT, CITY OF | Cedar Street Pump Station Improvements                                        | 10/19/2012   | 11/1/2012     | 11/1/2012  |
| 02310  | FLINT, CITY OF | Smith Villagee Redevelopment                                                  | 5/16/2011    | 5/17/2011     | 5/17/2011  |
| 02310  | FLINT, CITY OF | Flint WTP Chlorine Station, Flint                                             | 4/1/2010     | 9/10/2010     | 9/10/2010  |
| 02310  | FLINT, CITY OF | Martin Luther King Avenue Improvements Project, Flint                         | 5/17/2010    | 5/27/2010     | 5/27/2010  |
| 02310  | FLINT, CITY OF | Clio Road Rehabilitation, Flint                                               | 1/8/2010     | 1/15/2010     | 1/15/2010  |
| 02310  | FLINT, CITY OF | Chevrolet Avenue Reconstruction, Flint                                        | 11/13/2009   | 11/30/2009    | 11/30/2009 |
| 02310  | FLINT, CITY OF | Flint DWRF Project 7301-01                                                    | 10/19/2009   | 10/23/2009    | 10/23/2009 |
| 02310  | FLINT, CITY OF | Kettering Gateway Project, Flint                                              | 6/29/2009    | 7/1/2009      | 7/1/2009   |
| 02310  | FLINT, CITY OF | Water Sorage Tank-Interior and Exterior Renovation and Repairs, Flint         | 4/30/2009    | 5/11/2009     | 5/11/2009  |
| 02310  | FLINT, CITY OF | Water Storage Tank-interior and exterior renovations and repairs, Flint       | 4/30/2009    | 5/11/2009     | 5/11/2009  |
| 02310  | FLINT, CITY OF | Flint WTP Improvements                                                        | 10/29/2008   | 11/25/2008    | 11/25/2008 |
| 02310  | FLINT, CITY OF | Torrey Road Booster Pump Station Improvements, Flint                          | 5/1/2008     | 9/12/2008     | 9/12/2008  |
| 02310  | FLINT, CITY OF | Holly Avenue, Flint                                                           | 7/11/2008    | 7/14/2008     | 7/14/2008  |
| 02310  | FLINT, CITY OF | Smith Village Redevelopment, Williams Street Relocation, Flint                | 7/3/2008     | 7/3/2008      | 7/3/2008   |
| 02310  | FLINT, CITY OF | Brush Alley WM Ext                                                            | 10/23/2007   | 11/6/2007     | 11/6/2007  |
| 02310  | FLINT, CITY OF | Pierson Road WM Replacement                                                   | 7/9/2007     | 7/18/2007     | 7/18/2007  |
| 02310  | FLINT, CITY OF | Saginaw Street WM Replacement                                                 | 7/9/2007     | 7/18/2007     | 7/18/2007  |
| 02310  | FLINT, CITY OF | Webster Road WM Replacement                                                   | 7/9/2007     | 7/18/2007     | 7/18/2007  |
| 02310  | FLINT, CITY OF | Metawaneenee Hills, city of Flint                                             | 1/3/2007     | 1/10/2007     | 1/10/2007  |
| 02310  | FLINT, CITY OF | Third Avenue Reconstruction - Flint River (Sunset Dr.) to Saginaw Street, cit | 12/15/2006   | 1/3/2007      | 1/3/2007   |
| 02310  | FLINT, CITY OF | Flushing Road Reconstruction, city of Flint                                   | 9/25/2006    | 9/26/2006     | 9/26/2006  |
| 02310  | FLINT, CITY OF | Chevrolet Avenue Bridge over the Flint River, City of Flint                   | 3/29/2006    |               | 4/6/2006   |
| 02310  | FLINT, CITY OF | Sugar Maple Farms, Flint                                                      | 7/21/2005    |               | 8/1/2005   |
| 02310  | FLINT, CITY OF | Buckham Alley Watermain Project, Flint                                        | 3/24/2005    |               | 3/28/2005  |
| 02310  | FLINT, CITY OF | Riverside Townhomes                                                           | 9/1/2004     | 9/1/2004      | 9/3/2004   |
| 02310  | FLINT, CITY OF | Pierson Road WM                                                               | 5/24/2004    |               | 6/1/2004   |
| 02310  | FLINT, CITY OF | University Park - Phase 2 - Stage 2                                           | 1/8/2004     |               | 3/2/2004   |
| 02310  | FLINT, CITY OF | Court Street Village South                                                    | 5/1/2002     |               | 5/2/2002   |
| 02310  | FLINT, CITY OF | University Park Phase II WM Ext.                                              |              |               | 3/25/2002  |
| 02310  | FLINT, CITY OF | Hamilton Avenue WM Repl.                                                      |              |               | 3/21/2002  |

| ALTERN | NAME           | ProjectName                                          | ReceivedDate | AdminComplete | IssuedDate |
|--------|----------------|------------------------------------------------------|--------------|---------------|------------|
| 02310  | FLINT, CITY OF | East Blvd water distro                               |              |               | 10/8/2001  |
| 02310  | FLINT, CITY OF | Country Club Meadows                                 |              |               | 10/8/2001  |
| 02310  | FLINT, CITY OF | Cornelia St.                                         |              |               | 6/4/2001   |
| 02310  | FLINT, CITY OF | UPF Site/Leith Street St. John Blvd. Main Relocation | 2/20/2001    |               | 2/21/2001  |
| 02310  | FLINT, CITY OF | MLK Avenue                                           | 2/13/2001    |               | 2/14/2001  |
| 02310  | FLINT, CITY OF | Walgreens and Kentucky Fried Chicken                 | 9/15/2000    |               | 9/15/2000  |
| 02310  | FLINT, CITY OF | Smith Village - Root Street                          | 7/25/2000    |               | 8/4/2000   |
| 02310  | FLINT, CITY OF | Water Treatment Plant - PH1 - Segment 2              |              |               | 6/22/2000  |
| 02310  | FLINT, CITY OF | GM Infrastructure Phase 3                            | 3/9/2000     |               | 3/17/2000  |
| 02310  | FLINT, CITY OF | Windcliff Village                                    | 1/6/2000     |               | 1/21/2000  |



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

JUN 23 2015

REPLY TO THE ATTENTION OF:

WG-15J

Ms. Michelle R. George  
7719 Prairie Street  
Detroit, Michigan 48210

DEQ  
RESOURCE MANAGEMENT DIVISION

JUN 29 2015

Dear Ms. George:

LANSING DISTRICT

Thank you for your June 1, 2015 letter to Ken Kopocis, Deputy Assistant Administrator, U.S. Environmental Protection Agency (U.S. EPA), concerning drinking water quality in the cities of Detroit, Flint, and Highland Park, Michigan. Your letter was forwarded to me for a response since Michigan is located in Region 5 of the U.S. EPA.

My staff contacted the Michigan Department of Environmental Quality (MDEQ) District Supervisor for the Southeast Michigan District, Kris Donaldson, to discuss the Detroit shut-off of water service to Detroit citizens, and the possibility of Detroit shutting off water service to Highland Park. Highland Park has had problems with its billing process for a number of years. At this time, the Great Lakes Regional Authority/Detroit has not shut-off water service to Highland Park.

Ms. Donaldson can provide you with a status of the various negotiations/contracts currently underway between the Great Lakes Regional Authority and the City of Detroit, which includes water service to Highland Park. You can contact Ms. Donaldson at:

Kris Donaldson, P.E., District Supervisor  
Southeast Michigan District  
Office of Drinking Water and Municipal Assistance  
Michigan Department of Environmental Quality  
27700 Donald Court  
Warren, Michigan 48092  
(586) 753-3759  
[donaldsonk@michigan.gov](mailto:donaldsonk@michigan.gov)

Under the Federal Safe Drinking Water Act (SDWA), public water supplies must meet standards developed under the SDWA. Non-compliance may result in enforcement by the MDEQ or U.S. EPA.

While the SDWA regulates drinking water to ensure it meets health standards, U.S. EPA does not regulate how utilities operate administratively. Treating, storing and distributing drinking water from a lake or river source that meets SDWA requirements has significant cost, thus it is the responsibility of the water supply to set an appropriate water rate structure to fund existing and future costs to operate and maintain the water supply. However, U.S. EPA has no authority

in the decisions concerning setting of user charges or shutting off water service to customers. These are local jurisdictional issues. There is currently no Federal regulatory oversight of water utility rates in Michigan.

My staff also contacted the MDEQ Lansing District Supervisor, Steve Busch, to discuss Flint's drinking water issues. He and his staff continue to work closely with Flint's Water Department to ensure the non-compliance issues associated with *E. coli* and trihalomethanes (TTHM) experienced by Flint have been addressed. Flint has returned the bacteria MCL violations that occurred in August and September 2014 to compliance.

Compliance with the TTHM health standard is based upon the average of one year of sample data, from the most recent four quarters, at each sampling location. Flint implemented operational techniques at the drinking water treatment plant and in the distribution system to reduce the formation of TTHM compounds. Flint's actions have reduced TTHM concentrations to the point where the most recent results (May 2015) at all eight sample locations are below the drinking water TTHM health standard. Due to the exceedances in 2014, Flint must continue to provide quarterly public notification of TTHM concentrations. Flint continues to work with the MDEQ engineers to maintain the reduced TTHM levels within the distribution system.

For further information regarding MDEQ's oversight and assistance to the City of Flint regarding its drinking water quality, you can contact Mr. Busch at:

Steve Busch, District Supervisor  
Lansing District Office  
Office of Drinking Water and Municipal Assistance  
Michigan Department of Environmental Quality  
P.O. Box 30242  
Lansing, Michigan 48909-7742  
(517) 643-2314  
[buschs@michigan.gov](mailto:buschs@michigan.gov)

We appreciate your interest in this matter. If you have additional questions, please contact Jennifer Crooks of my staff at (312) 886-0244 or [crooks.jennifer@epa.gov](mailto:crooks.jennifer@epa.gov).

Sincerely,



Tinka G. Hyde  
Director, Water Division

cc: Mike Prysby, MDEQ  
Steve Busch, MDEQ  
Kris Donaldson, MDEQ  
Kris Philip, MDEQ  
Richard Benzie, MDEQ

Called 7/2

Called back + left VM

wrote Flat in DSSD

but need to talk to Flat

not a DEQ/SON decision



## Flint WTP Reliability

Rule 1006 Rated capacity of complete WTP

Rule 1204 Reg'd Capacity of CWS

### Redundancy

- 72" connection to DWSD
- Gen Co Interconnects

- Dual Feed

- Future Generator

### Finished Storage

37 MG Avg Day 12-13 MGD

2.5-3 days Storage

- Holloway Pump under low flow/min depth

30+ MGD

Max Day Demand  $\approx$  18 MGD



## Gray Road Site

- Physical Separation
- Berm Construction Into  
Compacted to min. 95%  
Std. Proctor Density
- 2 ft Precast
- ~~NPDES~~ - NPDES Outfall Blocked
- Decant lagoon isolated

WTP

- Mid Pt CI Installed
- CI system certified
- Door to CI Room Blocked off
- Signed Contract on LOX  
L-Nitro

- Chlorine Line is in  
Still under construction

Increased Booster Pump  
55 psi, insulated for mid pts

2 large mid pts (redundant)  
2 small

Exposed 4 way cross was leaking  
took back to joint

4 new valves (~~new~~ all raw water)

Entry contract w/ Chem Supplier

Changed Os Mix (were putting in too much)  
were all gassing

Electrical feed from consumers & switch gear  
is all done

1551 ✓

- DEQ staff

In Flint to check  
on construction progress  
not yet finished  
are also working on  
initial startup process of  
Water Treatment Plant but not  
yet serving

Parkinson  
- Stephanie NBC 25 water-

810-820-1367

Monday No Next week  
per city

- ~~Testing~~ Testing Dampby  
Flint Lab results to

✓ Kevin Rosen DEQ

NBC 12 in Flint

810-257-2800

810 341-6150 Direct

→ Dominic Adams  
(810)-241  
1st VM

Ozinko  
Equipment



NATURAL RESOURCES DEFENSE COUNCIL

October 15, 2015

Via Federal Express and Electronic Mail to:

Freedom of Information Act Coordinator  
 Department of Environmental Quality  
 P.O. Box 30457  
 Lansing, MI 48909-7957  
 deqfoia@michigan.gov

Re: FOIA Request for Records Concerning Administration of the Safe Drinking Water Act's Lead and Copper Rule

Dear FOIA Coordinator:

I write on behalf of the Natural Resources Defense Council (NRDC) to request disclosure of records pursuant to the Michigan Freedom of Information Act (FOIA), 15 Mich. Comp. Laws §§ 15.231, et seq.

I. Description of Records Sought

Please produce records<sup>1</sup> in Michigan Department of Environmental Quality's (MDEQ's) possession, custody or control concerning testing and monitoring for lead in the City of Flint's (Flint's) drinking water and which reflect the following:

1. ~~Records concerning any program established or maintained by Michigan "to assist local educational agencies in testing for, and remedying, lead contamination in drinking water from coolers and from other sources of lead contamination at schools" pursuant to 42 U.S.C. § 300j-24.~~
2. Records concerning MDEQ's designation of an optimized corrosion control treatment program for Flint's water system ~~and/or the Detroit Water and Sewerage Department's drinking water system, and/or MDEQ's approval of a corrosion control treatment option recommended by Flint or the Detroit Water and Sewerage Department. 40 C.F.R. § 141.82(d)(1).~~
3. Records created or received by MDEQ concerning MDEQ's review and/or approval of the addition of the Flint River as a primary water source for Flint's

<sup>1</sup> "Records" means anything denoted by the use of that word or its singular form in the text of FOIA and includes correspondence, minutes of meetings, memoranda, notes, emails, notices, facsimiles, charts, tables, presentations, orders, filings, and other writings (handwritten, typed, electronic, or otherwise produced, reproduced, or stored).

water system, or the Flint River's designation as an alternate water source in Flint's emergency response plan as an emergency or backup water source. Mich. Admin. Code R. 325.12303.

April 16, 2013

4. Records created or received by MDEQ from January 1, 1991, to the present concerning any long-term change in treatment to Flint's water system, including any "written documentation to the State" submitted by the City describing any change in water treatment or addition of a water source, and any approval or disapproval of such long-term changes. 40 C.F.R. § 141.90(a)(3).
5. Records from January 1, 2012, to the present concerning any modification of the monitoring requirements in the Lead and Copper Rule based on the interconnection between Flint's water system and the Detroit Water and Sewerage Department's water system. This includes, but is not limited to:
  - a. Any written explanation concerning how the monitoring, treatment, and reporting requirements will be administered and enforced in the Flint water system (a consecutive water system); and
  - ~~b. Any records concerning U.S. EPA's approval, disapproval, or other response to MDEQ's proposal to implement the requirements in the Lead and Copper Rule for the Flint water system based on the interconnection between Flint's water system and the Detroit Water and Sewerage Department.~~
6. Records reflecting any tap water monitoring of the Flint water system for lead conducted from the period of April 1, 2014, through the present, including:
  - a. Correspondence between Flint officials and MDEQ officials;
  - ~~b. All tap water samples submitted by Flint to the testing laboratory;~~
  - ~~c. All tap water sample lab reports submitted by the laboratory to Flint;~~
  - d. All tap water sample lab reports submitted by Flint to MDEQ; and
  - e. All consumer notices sent by Flint to participants of lead and copper monitoring and subsequently provided to MDEQ.
7. Any records (including correspondence) concerning the invalidation of lead and copper monitoring results for Flint's water system from January 1, 2012, to the present, including:
  - a. Any written "decision and . . . rationale" concerning invalidated samples, 40 C.F.R. § 141.86(f); and
  - b. Records concerning any decision by MDEQ to invalidate tap water lead samples taken in Flint maintained pursuant to 40 C.F.R. § 142.14(d)(10)(iii) ("Each State which has primary enforcement responsibility shall retain, for not less than 12 years, files which shall include for each such public water system in the State: . . . (10) Records of State activities, and the results thereof, to . . . (iii) Invalidate tap water lead and copper samples under § 141.86(f) of this chapter.").
8. Records concerning any "materials evaluation of [Flint water system's] distribution system" conducted between 1991 and today to "identify a pool of targeted sampling sites" for purposes of monitoring under the Lead and Copper Rule. 40 C.F.R. § 141.86(a)(1).
- ~~9. Records concerning any decision by MDEQ to allow Flint to conduct "reduced monitoring" under the Lead and Copper Rule, pursuant to 40 C.F.R. § 141.86(d)(4).~~

10. Records concerning the control of lead and copper by Flint from January 1, 2012 to the present, maintained pursuant to 40 C.F.R. § 142.14(d)(8)(i)-(v), (ix)-(x), and (xvii).

## II. Request for a Fee Waiver

NRDC requests that MDEQ waive any fee it would otherwise charge for search and production of the records described above. FOIA dictates that requested records may be provided without charge or at a reduced charge "if the public body determines that a waiver or reduction of the fee is in the public interest because searching for or furnishing copies of the public record can be considered as primarily benefiting the general public." Mich. Comp. Laws § 15.234.

NRDC requests these records solely to benefit the general public. NRDC is a non-profit environmental and public health advocacy organization. NRDC works to ensure that all Americans have access to safe and affordable drinking water. The records requested shed light on a matter of considerable public interest: Flint's monitoring for lead in the drinking water. There is broad public concern about the levels of lead in Flint's drinking water, including dangers that such elevated lead levels may pose to the health of Flint residents. Disclosure of these records will benefit the general public by allowing NRDC to provide information to the public and otherwise assist in addressing the ongoing concerns of the public in Flint. Disclosure of these records will help the public, in particular residents of Flint, evaluate more effectively the potential threats to themselves and their families. NRDC has no commercial interest in these records.

## III. Willingness to Pay Fees Under Protest

Please provide the records requested above regardless of your fee waiver decision. In order to expedite a response, NRDC will, if necessary and under protest, pay fees in accordance with Michigan's FOIA provisions at Mich. Comp. Laws § 15.234, and MDEQ's procedures and guidelines, for all or a portion of the requested records. Please contact me before doing anything that would cause the fee to exceed \$500. NRDC reserves its rights to seek administrative or judicial review of any fee waiver denial.

## IV. Conclusion

Please email or (if it is not possible to email) mail the requested records to me at the NRDC office address listed below. Please send them on a rolling basis; MDEQ's search for—or deliberations concerning—certain records should not delay the production of others that MDEQ has already retrieved and elected to produce. See generally Mich. Comp. Laws § 15.235. If MDEQ concludes that any of the records requested here are publicly available, please let me know.

Please do not hesitate to call or email with questions.



Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read 'Evan Feinauer', with a long horizontal stroke extending to the right.

Evan Feinauer, Litigation Fellow  
Natural Resources Defense Council, Inc.  
20 North Wacker Drive, Suite 1600  
Chicago IL 60606  
(312) 651-7938  
efeinauer@nrdc.org

## Proposed Scope of Upgrades to Flint WTP

### Phase II - Segments I & II

#### 1. Introduction

The City of Flint plans to utilize their existing WTP to provide water on a continuous basis. The city plans to treat water from the Flint River until construction of the proposed KWA supply is complete and the WTP can then be used to treat water from Lake Huron. The following proposed improvements are needed to place the WTP into service next spring. These improvements will remain in service once the KWA is in service.

#### 2. Scope of Work

The proposed upgrades have been categorized into Phase II -- Segment I and are to be completed as soon as practical so that the WTP can be utilized to treat water from the river in the spring of 2014. Engineering services will include final design, plans, contract documents, bidding assistance. Since time is of importance, specifications and schematic drawings will also be provided for pre-procurement of long lead item equipment and are outlined within each section below. Contract administration and construction phase services are not included within the initial scope of services.

- Design Progress Meetings: Meet with City staff to provide project status updates and to discuss specific design issues and details in order to facilitate timely design decisions. Meetings will include design team personnel from each discipline as required, City operations staff and administrative staff. Five (5) design progress meetings are included.
- Prepare and update opinion of probable construction cost at for each project bidding document submittal (40%, 80% and Final Draft). Prepare final opinion of probable construction cost prior to bidding.
- Quality Assurance/Quality Control: A Quality Control Plan (QCP) will be developed and implemented specifically for this project. At each project submittal stage, the document deliverables will be checked and reviewed by experienced personnel to ensure that the design meets applicable standards and normal engineering practice.
- Deliverables:
  - 40% Bidding Documents (Drawings and Technical Specification Outline)
  - 80% Bidding Documents (Drawings and Technical Specifications)
  - Final Draft Bidding Documents (Drawings and Technical Specifications)
  - Final Bidding Documents (One printed and one electronic set of Drawings and Technical Specifications)
- Bidding Phase
  - Conduct pre-bid meeting;
  - Respond to contractor inquiries.
  - Prepare construction document addenda, as necessary.



Review bids and supporting bid documentation. Prepare bid report summarizing bids, contractor references, and contractor qualifications; make recommendation for contract award.

• Construction Phase

Review and respond to contractor submittals (First two reviews are included in level of effort, subsequent review cost will be paid for by contractor)

Respond to contractor's request for information

Prepare monthly payment documents

Negotiate and prepare change orders for client review and approval

Attend monthly project meetings

Provide periodic onsite technical observer (have included two weeks per month in level of effort)

Develop record documents (provide one hard and one electronic copy to owner)

Specific Work Tasks:

Item 1 – Chemical Systems / Ozone

The Michigan Department of Environmental Quality (MDEQ) requires 30 days of redundant storage of the chemical used in this treatment process. To bring the rehabilitated plant into regulatory compliance with the chemical storage requirements for primary use, additional storage facilities will need to be constructed for liquid oxygen and nitrogen.

One liquid oxygen and one liquid nitrogen storage tanks and unloading stations identical to the existing units will be installed north of the existing facilities. Details are listed as follows:

|                            |                             |
|----------------------------|-----------------------------|
| • Liquid Oxygen            | Liquid Nitrogen             |
| Capacity – 9000 gallons    | Capacity – 540 gallons      |
| Diameter – 10 ft (maximum) | Diameter – 5.5 ft (maximum) |

Pre-procurement documents for the liquid oxygen and nitrogen tanks will be provided.

Item 2 – Electrical

The City of Flint Water Treatment Plant (WTP) represents a combination of administrative, process, and maintenance facilities which all require electrical power. At the completion of Phase I of the water treatment plant rehabilitation projects, much of the electrical distribution equipment such as motor control centers (MCCs), power/lighting panels, transformers, and electrical power feeders will have been upgraded. There is, however, significant additional work required to address remaining electrical equipment that has reached a point of obsolescence.

Switchgear in the sub-station was installed around 1960. It is antiquated and difficult to maintain. Very little work has been done to the station since its original installation. The plant has two 46 kV primary feeds into the sub-station. Replacement of the distribution switchgear with current technology



equipment would allow a higher degree of load protection, be serviceable by numerous sources, and have replacement parts availability. When the switchgear is replaced, the plant will have to stay in operation. Brief interruptions of power of selected plant processes could be accommodated during cut over to new equipment.

#### Proposed Substation Upgrade

- Coordinate upgrades to Consumers 46kV primary feeders to provide a single overhead 46KV primary service
- Replace the two Consumers 2.5kVA substation transformers and overhead structure with two 2.0 to 2.5 kVA 46KV pad-mounted transformers.
- Replace the City's substation switchgear in the substation building.

Pre-procurement documents for the pad mounted transformers and switchgear will be provided.

Pump Station No.4 contains the largest electrical loads in the plant. Four low service pumps and five high service pumps represent a combined total of approximately 4000 horsepower. Additional loads from HVAC, lighting, controls, and chemical feed are about 60 kVA. This represents a total load of 531 amps @ 2400 volts. The existing switchgear in Pump Station No.4 is antiquated and difficult to maintain. Current technology equipment will allow a higher degree of load protection.

#### Proposed Pump Station No. 4 Improvements

- Replace 2400V switchgear
- Provide one 15 MGD medium voltage VFD

Pre-procurement documents for the medium voltage VFD and switchgear will be provided.

As a base load facility capable of producing water at any time the Flint WTP must have the ability to deal with power outages. In order to meet these electrical need in the event of a loss of power to the plant site or the loss of one of the substation transformers a new standby diesel generator is proposed to be located adjacent to the new substation.

#### Proposed Standby Power Improvements

- One 2.0 to 2.5 mVA generators and fuel tank.

Pre-procurement documents for the generator set will be provided.

There are four 2400V to 480V transformers in Plant 2 that are antiquated and difficult to maintain. Replacement parts are no longer available and reliability is questionable.

#### Proposed Plant 2 Improvements

- Replace two 300kVA 2.4KV transformer/switchgear.
- Replace two 100kVA 2.4KV transformer/switchgear.



Pre-procurement documents for the transformers and switchgear will be provided.

### Item 3 – Mid-Point Chlorination

Mid-point chlorination facilities are proposed to increase reliability of the disinfection process and improve Ct. For this initial stage the existing chlorine equipment in Pump Station No. 4 will be used and a new chlorine solution line will be installed from Pump Station No. 4 to the filter influent channel in Plant 2. A chlorine scrubber system will be installed in Pump Station No. 4 to protect against a leaking chlorine ton container.

#### Proposed Chlorine Improvements

- \* New chlorine solution line to filter gallery.
- \* Chlorine system improvements.
- \* Dry scrubber system.

### Item 4 – Low and High Service Pump Station No. 4

As a result of decreased demands, pumps at Pump Station No. 4 are “over-sized” and do not efficiently operate. Some of the pumps experience vibrations in the shafts and steady bearings. The existing pump station will be rehabilitated to replace “over-sized” pumps and obsolete equipment and provide needed maintenance.

#### Proposed Pump Station No. 4 Improvements

- \* Install one new High Service Pump (1.5 MGD @190 feet TH, vertically mounted pumps with 800 HP 2400/4160 V inverter duty motors, with 20 feet of shaft and steady bearings)
- \* Replacement of existing piping, valves, supports, and bearings
- \* New intermediate platforms, ladders, & stairs
- \* New ventilation (for exhausting heat from VFD's)
- \* Demolition of existing equipment to accommodate new equipment

Pre-procurement documents for the pump, motor, control valves and isolation valves will be provided.

### Item 5 – Raw Water Piping Connection

The proposed KWA raw water pipeline will connect to the existing 72" PCCP finished water supply line near Center and Pierson Roads. (East of this connection, the 72" PCCP will be utilized by GCDG-WWS for distribution of finished water in the GCDG-WWS service area.) Raw water from Lake Huron will be conveyed to the WTP site via the 72" PCCP pipeline. On the WTP site, the 72" pipeline will be tapped for a 42" pipe and for a 36" pipe to convey raw water for treatment. Connections to the existing pipe will be made at this time to avoid future plant shutdowns for connections.



#### Proposed Pump Station No. 4 Improvements

- 48-inch pipe connections
- 36-inch pipe connection
- 54-inch pipe connection

Pre-procurement documents for the valves and connection fittings will be provided.

#### Phase II – Segment II:

The proposed upgrade for item 6 has been categorized as Phase II – Segment II and is to be completed with the same urgency as the rest of the work so that the WTP can be utilized to treat water from the river in the spring of 2014. However, the use of the Bray Road lagoon for other disposal activities will require that this issue be addressed independently to certain extent as to isolate the problem areas while working with MDEQ to permit its use for lime sludge disposal.

#### Item 6 – Softening Residuals Disposal

Develop, evaluate, design and implement a lime residuals disposal plan to handle softening sludge for the interim period of operation using the Flint River as a water source. These options may include the use of Bray Road lagoon, construction of temporary dewatering and loading facilities, and other temporary storage options.

The use of Bray Road Lagoon will require additional survey, geotechnical and environmental testing at the site in order to assess the condition of the lime sludge in the basin and to verify the capacity of the lagoon system. Based on the findings of this evaluation, proposed improvements will be designed to accommodate the use of the facility in the interim basis while addressing some of the MDEQ concerns about the site and any unauthorized discharges into the nearby stream. Permitting for site use will be incorporated as part of the overall design improvements at the WTP and submitted to the MDEQ at the 80% design stage for their pre-permit review and comments. A final package will be submitted to the MDEQ at the 100% design stage for permit issuance and approval of work plan.

Pre-procurement documents for specific equipment may be provided as needed.

### **3. Schedule**

The work included in this work authorization is anticipated to be performed in accordance with the following schedule, based on the Notice-To-Proceed (NTP) date of November 1, 2013. For the purposes of this proposal, we anticipate a 3 month design phase and 1 month bid phase. Schedule revisions may be necessary as information becomes available and work priorities change.



| <u>Project Milestone</u>             | <u>Date</u>       |
|--------------------------------------|-------------------|
| Project Kickoff Meeting              | November 6, 2013  |
| Equipment Procurement Documents      | December 6, 2013  |
| Submit 40% Bidding Documents         | December 18, 2013 |
| Submit 80% Bidding Documents         | January 10, 2014  |
| Submit Final Draft Bidding Documents | January 31, 2013  |
| Submit Final Bidding Documents       | February 7, 2014  |
| Bid Advertising                      | February 10, 2014 |
| Pre-Bid Meeting                      | February 17, 2014 |
| Bid Opening                          | TBD by City       |
| Recommendation of Contract           | TBD by City       |
| Contract Award issued by City        | TBD by City       |

#### 4. Compensation

The Reimbursable Compensation method with a maximum not-to-exceed limit will be used for this contract. Labor rates shall be based on personnel classifications according to the existing rate sheet. Reimbursable expenses shall be invoiced at the actual cost times a factor of 1.0 for processing and handling. The estimated maximum not-to-exceed fee for this project is \$962,800 which includes a \$15,000 allowance for surveying and \$15,000 allowance for geotechnical services.

| <u>Description</u>                     | <u>Fee</u>        |
|----------------------------------------|-------------------|
| Design and Bidding Assistance          | \$ 752,800        |
| Surveying Allowance                    | \$ 15,000         |
| Geotechnical Allowance                 | \$ 15,000         |
| Construction Phase Services            | \$ 180,000        |
| <b>Total Maximum Not to Exceed Fee</b> | <b>\$ 962,800</b> |

Any other work beyond the Scope of Services herein will require a subsequent Work Authorization with prior approval from the City.



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



DAN WYANT  
DIRECTOR

August 17, 2015

Mr. Brent Wright  
City of Flint - DPW  
Flint Water Plant  
4500 North Dort Highway  
Flint, Michigan 48505

Dear Mr. Wright:

SUBJECT: Flint, City of WSSN: 02310  
Lead and Copper Monitoring of Drinking Water Taps

The Department of Environmental Quality (DEQ), Office of Drinking Water and Municipal Assistance (ODWMA), received your report for the monitoring period January 1, 2015, through June 30, 2015.

| Action Levels                      | Results this monitoring period |                                 |                       |                        |
|------------------------------------|--------------------------------|---------------------------------|-----------------------|------------------------|
|                                    | 90th Percentile                | # of Samples Above Action Level | # of Samples Required | # of Samples Collected |
| Lead 15 parts per billion (ppb)    | 11 ppb                         | 6                               | 60                    | 69                     |
| Copper 1.3 parts per million (ppm) | 0.16 ppm                       | 0                               | 60                    | 69                     |

Ninety percent or more of the sites you tested are within action levels under the administrative rules promulgated under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399). These results must be reported on your 2015 Consumer Confidence Report (CCR) due to our office, your customers, and the local health department, by July 1, 2016. Also include the following statement in the CCR, regardless of the lead and copper levels:

*If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Flint is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or at <http://www.water.epa.gov/drink/info/lead>.*



August 17, 2015

Recent changes to the Lead and Copper Rule (LCR) require the water supply to provide individual lead tap results to people who receive water from sites that were sampled, even if lead was not detected, within 30 days of learning of results. You must also send us a certification that you met all the delivery requirements along with a sample copy of your customer notice by three months after the end of the monitoring period. To download the *Lead and Copper Report and Consumer Notice of Lead Result Certificate* in Microsoft Word or PDF format, visit <http://www.michigan.gov/deq>. Click on Water, Drinking Water, Community Water Supply, and Reporting Forms under the Manuals, Forms and Brochures heading. Water supplies that fail to distribute the Consumer Notice of Lead Results must include the following statement in their CCR, "During the year, we failed to provide lead results to persons served at the sites that were tested as required by the Lead and Copper Rule."

While the City's LCR compliance monitoring has continued to meet action level requirements, the LCR also requires all large systems (those serving over 50,000 people) to optimize corrosion control regardless of their 90th percentile lead concentration. One way to demonstrate fully optimized corrosion control treatment is through two consecutive six month rounds of LCR compliance monitoring in which the difference between the 90th percentile level and the highest source water lead concentration is less than the Practical Quantitative Level for lead (0.005 milligrams per liter). Since the City did not meet these criteria in both the July – December 2014, and January – June 2015, sampling periods, the City must now recommend a treatment to fully optimize corrosion control treatment within six months in accordance with requirements under Act 399, Administrative Rule 604f (R 325.10604f). **This recommendation must be provided to our office as soon as possible, but no later than January 1, 2016.**

However, given the past use of phosphate treatment by the Detroit Water and Sewerage Department (DWSD) to fully optimize corrosion control treatment when the City was a wholesale customer of DWSD, the ODWMA recommends the City select this as its recommended treatment option, and begin implementation as soon as possible to address ongoing concerns by customers regarding lead levels within their premise plumbing systems. Under the second step of this Rule, the DEQ can specify optimal corrosion control treatment.

Our office will inform you when monitoring needs to be conducted as part of the optimization of the implemented corrosion control treatment. Customer requested samples for lead shall continue to be collected and analyzed. Please make every attempt to select the same sites used in the previous monitoring period, giving Tier 1 sites first priority. If original sites are unavailable, select replacement sites based on the Tier 1, 2, and 3 criteria.

Please contact me at 517-284-6644 or [rosenthala@michigan.gov](mailto:rosenthala@michigan.gov) at your earliest convenience to discuss how the City will be complying with the above requirements.

Sincerely,



Adam Rosenthal, Environmental Quality Analyst  
Lansing District Office  
Office of Drinking Water and Municipal Assistance

cc: Mr. Michael Glasgow, City of Flint

## **Busch, Stephen (DEQ)**

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**From:** Lytle, Darren <Lytle.Darren@epa.gov>  
**Sent:** Monday, January 04, 2016 1:27 PM  
**To:** Busch, Stephen (DEQ)  
**Cc:** Prysby, Mike (DEQ)  
**Subject:** RE: Quesion

Thanks much. Really appreciate it. We are planning to visit Flint later this month. Sounds has been a bit happening over the last month or so. Darren

Darren A. Lytle, Ph.D., P.E.  
Branch Chief (Acting)  
U.S. Environmental Protection Agency  
26 West Martin Luther King Dr.  
Cincinnati, Ohio 45268  
Phone: (513) 569-7432  
Fax: (513) 487-2543  
email: lytle.darren@epa.gov

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**From:** Busch, Stephen (DEQ) [mailto:BUSCHS@michigan.gov]  
**Sent:** Monday, January 04, 2016 1:02 PM  
**To:** Lytle, Darren <Lytle.Darren@epa.gov>  
**Cc:** Prysby, Mike (DEQ) <PRYSBYM@michigan.gov>  
**Subject:** RE: Quesion

Darren,

Adam was able to pull the info you requested and it is in the attached email, there are 4 pdfs.

Stephen Busch, P.E.  
MDEQ Lansing District Coordinator  
Office of Drinking Water and Municipal Assistance  
Lansing and Jackson District Supervisor  
517-643-2314  
[buschs@michigan.gov](mailto:buschs@michigan.gov)

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**From:** Lytle, Darren [mailto:Lytle.Darren@epa.gov]  
**Sent:** Thursday, December 17, 2015 6:55 AM  
**To:** Prysby, Mike (DEQ)  
**Cc:** Busch, Stephen (DEQ)  
**Subject:** Quesion

Mike,

Could you provide me Flint distribution system water quality data going back maybe 3 years? I am interested in TCR sampling results, chlorine data, etc... I am interested in comparing historic data to the latest data albeit more extensive now as it comes in.

Thanks much, Darren

Darren A. Lytle, Ph.D., P.E.  
Branch Chief (Acting)  
U.S. Environmental Protection Agency  
26 West Martin Luther King Dr.  
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**From:** Prysby, Mike (DEQ) [<mailto:PRYSBYM@michigan.gov>]  
**Sent:** Friday, October 16, 2015 1:32 PM  
**To:** Lytle, Darren <[Lytle.Darren@epa.gov](mailto:Lytle.Darren@epa.gov)>; Schock, Michael <[Schock.Michael@epa.gov](mailto:Schock.Michael@epa.gov)>  
**Cc:** Busch, Stephen (DEQ) <[BUSCHS@michigan.gov](mailto:BUSCHS@michigan.gov)>  
**Subject:** FW: Flint WTP PH2 SEG4 - Corrosion Control

Darren, Michael

We have received Flint's corrosion control proposal from their consultant. If you have comments, please provide them to me by Monday morning.

Michael Prysby, P.E.  
District Engineer  
Office of Drinking Water and Municipal Assistance  
517 290-8817

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**From:** Matta, Samir [<mailto:SFMatta@lan-inc.com>]  
**Sent:** Friday, October 16, 2015 12:02 AM  
**To:** Prysby, Mike (DEQ)  
**Subject:** Flint WTP PH2 SEG4 - Corrosion Control

Hi Mike,

Please see attached plans for the Corrosion Control Plan for the City of Flint. I will have the official submittal package to you tomorrow afternoon after I get Brent or Mike's signature on the permit application. I will call you when I get back in Lansing to drop the package. Is three sets of full size plans adequate? Would you like some half size plans? Let me know.

#### **Basis of Design**

Given that Flint will require lead and copper corrosion control and given that Detroit utilizes orthophosphate for their corrosion control methodology, and that Flint will be receiving Detroit water for the immediate future, orthophosphate is the appropriate corrosion control methodology for Flint. A dosage of 0.8 mg/l as PO<sub>4</sub> has been recommended for the Detroit water. Numerous utilities utilizing Lake Michigan water have a target dosage of 0.9 mg/l as PO<sub>4</sub>. Therefore, a target dosage in the range of 0.8 to 0.9 mg/l appears appropriate.

It is expected that, at least initially, there will be a significant PO<sub>4</sub> demand in the system. This will require a significantly higher dosage until this demand is satisfied and the target residual can be maintained. We are therefore designing for capability of a maximum dosage of 1.5 mg/l.

The arriving Detroit water will likely have some residual  $\text{PO}_4$  when it arrives at Flint. It has been reported that this residual will be approximately 0.4 mg/l. The system must therefore be capable of a minimum dosage of 0.4 mg/l.

Based upon the usage of 75% Phosphoric Acid and a flow range of 4 MGD to 25 MGD, with an average day of 16 MGD, the expected feed rate will be 1.35 to 32 gpd. Average Phosphoric Acid feed is expected to be 10.8 gpd, requiring 30 days storage of 325 gal.

Orthophosphate will need to be applied at two locations. Detroit water will enter the Flint system at Control Station CS2, and supplementary phosphate will be applied there. However, on occasion some incoming water may need to be diverted to the Dort Reservoir, bypassing CS2. This water would then be introduced to the system through High Service Pump Station PS4 and phosphate would be introduced at this location.

Please let me know if the information is adequate or you require additional information.

Thanks.

**Samir F. Matta, PE**  
Team Leader



**Lockwood, Andrews  
& Newnam, Inc.**  
A LEO A DALY COMPANY

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EM SUBMISSION NO.: 2013EM041

PRESENTED: 3-28-13

ADOPTED: 3-29-13

BY THE EMERGENCY MANAGER:

**RESOLUTION TO PURCHASE CAPACITY FROM  
KAREGNONDI WATER AUTHORITY**

The Karegnondi Water Authority (KWA) is a governmental consortium of cities and counties in southeastern Michigan that was created to build a water pipeline that will provide water from Lake Huron to interested communities in Sanilac, Lapeer, and Genesee counties. The incorporating bodies that created the KWA are Sanilac County, Lapeer County, Genesee County, the City of Flint, and the City of Lapeer.

The City of Flint is currently in a year to year contract with the City of Detroit for the purchase of water. A study was conducted that projected that staying with Detroit will cost the region \$2.1 billion over the next 25 years. In contrast, if the region builds its own pipeline, the projected costs are \$1.9 billion over the same period. After the initial 25 year period, the projected costs would be less than 25% of the projected water costs from Detroit.

In order to build the pipeline, the KWA needs commitment from its members regarding the capacity that each member will purchase in the pipeline. The KWA is allowed to withdraw 85 million gallons of water per day. Capacity is available to members in increments of 1 million gallons per day known as units. For each unit of capacity that a member purchases, the buyer shall pay to the KWA a one time fee of \$32,300.00. Additionally, the buyer shall pay to the KWA not less than \$32,300.00 per unit per year until such time as water is made available to the buyer. After water is made available, the buyer shall pay to the KWA an estimated amount not to exceed \$355,300.00 per unit per year until such time that the bonds are paid in full. If it is determined that the costs per unit will exceed \$355,300.00 the buyer has a right to cancel the contract.

The purchase of capacity along with the payment of other costs necessary to operate the pipeline gives the member a right to water for sale to its customers. The buyer has a right to resell capacity and water rights. Each party entering into a capacity contract shall also be entitled to appoint additional board members equal to the party's percentage share of the total capacity under contract.


It is in the long term best interests of the City of Flint to enter into a contract with the KWA to purchase up to eighteen (18) units of capacity.


IT IS RESOLVED that City officials are authorized to enter into a contract with KWA to purchase up to eighteen (18) units of capacity.

IT IS FURTHER RESOLVED that the City Administrator is authorized to provide KWA information needed to administer the contract and, with approval of the Chief Legal Officer, to make minor (non-material) modifications to the contract.

APPROVED AS TO FORM:

APPROVED AS TO FINANCE:

  
Peter M. Bade, City Attorney

  
For Gerald Ambrose, Finance Director

EM DISPOSITION:

ENACT ✓

FAIL \_\_\_\_\_

DATED 3-29-13

  
Edward L. Kirtz, Emergency Manager

## FAQs for Media Q&As

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### Switch to Great Lakes Water Authority

#### **What finally pushed the state to this decision?**

This was the City's request, and the Governor supports it, based on several key factors:

In the near term, DWSD water will be easier to manage. It comes from a more stable source than the river, it is fully optimized for corrosion control, and it is clear that residents of Flint have more confidence in this water source.

#### **Will this solve Flint's water crisis?**

In combination with the other short term, intermediate term and long-term steps outlined last week, this move represents a big step forward. Flint still has serious system maintenance challenges it must address.

#### **If you're saying residents will still have lead because of their plumbing, does that mean every other city in this state has a lead problem?**

Many areas of the state have lead in their infrastructure mix.

#### **Where's the state getting the money to fund this?**

We have submitted a formal request to lawmakers via the appropriations process.

#### **Where's the city getting the money to fund this?**

The city is contributing all it can, and is getting assistance for its match from the Mott Foundation.

#### **How long will the switch take?**

The switch will be completed by the City and Great lakes Water Authority, but our understanding is that it can be accomplished in the very near term once the arrangements are complete.

#### **How long will it take before Detroit's corrosion controls provide protection for Flint?**

It will take some time for the corrosion control additives to build on pipe walls throughout the system. Estimates vary. The state can assure we will commence monitoring of the system early 2016 and report results as we get them to keep the community updated.

#### **Why do residents still need to use filters and bottled water?**

The filters and bottled water are responsible precautions for any resident concerned about lead exposure.

#### **Do the filters actually work? We've been hearing they don't protect for lead.**

Yes, the filters work. They are all certified for lead removal by the National Sanitation Foundation.

#### **The filters are only good for 100 gallons. What happens when they are used up?**

They will need to be replaced. And residents can get a new filter.

#### **What about restaurants?**

#### **What's going to be done about lead service lines?**

Long term, this is the only permanent solution to lead exposure. The state has committed to helping the city accomplish this goal long term.

**Do you wish you'd made this switch sooner?**

We support the City's decision. We can't look backward. We feel the state has responded quickly and effectively as information has surfaced, been investigated and verified. While the City of Flint is, right now, in compliance with the federal Lead and

Copper Rule, we recognize there is a disparity between surveillance testing and other testing happening in the community that we need to better understand and we are working on developing our knowledge.

Schools testing

**What do these results say?**

The results say we need to further investigate Flint schools and help the schools find clearer causes for some the results we got.

**Any theories about what's going on?**

It is possible there are specific points in the plumbing that have lead components which need to be replaced, but we can't say anything definitively until we perform an investigation at each school.

**Do the schools have lead service lines? If not, why are they getting such high results?**

The schools we tested initially do not have lead service lines. There are a few possible reasons why lead is being detected at specific points in the buildings and not others. When we know things definitively, we will make the information public.

**How long do the schools have to stay on bottled water? Just until the switch to Detroit, or longer term?**

We are encouraging the schools to continue their current protective measures as a precaution until we can get into the buildings and get more answers.

**Why did you only test 13 schools?**

That was what the Flint Public Schools requested.

**What happens to other schools?**

We will test all the schools in Flint if they request it.

**What about the schools that can't afford to update their entire plumbing systems?**

This is why we are having plumbing assessments completed. There is no way to know yet what each building will require.

**How confident are you in your testing? You've got results all over the map.**

We are confident that our testing meets the requirements for the federal Lead and Copper Rule, which is surveillance monitoring. The bigger question is whether surveillance monitoring meets the public health protection standards that Lead Exposure Testing methods do. The EPA is working on that question now, and we are engaged in that dialogue.

**What do you mean by "health exposure testing"? What are you doing next?**

The 90<sup>th</sup> percentile of your results is still below 15 ppb. Does that make you more or less confident in your testing and in your protocols?



It makes us confident that the testing protocol delivers consistent results. But again, it does raise questions about whether this testing method shows what people think it does or what they really want to know, which is actual lead exposure from lead plumbing in a home.

**Any idea how long kids have been exposed to lead? Was it before the move to the Flint River?**

That is possible. We don't know.

**How does the state bring this new information into the broader picture of kids' lead exposure across the state?**









|                          |   |   |         |
|--------------------------|---|---|---------|
| 2802 Westwood Pkwy.      | 1 | L | no data |
| 860 Schafer St.          | 1 | L | C,P     |
| 1821 S. Franklin Ave.    | 1 | L | no data |
| 1616 Durand St.          | 1 | L | no data |
| 928 Durand               | 1 | L | no data |
| 2750 Westwood Plany      | 1 | L | no data |
| 1543 Kearsley Park Blvd. | 1 | L | no data |
| 2920 Parkside Dr.        | 1 | L | no data |
| 2741 Westwood Plany      | 1 | L | no data |
| 1892 Durand St.          | 1 | L | no data |
| 2560 Thomas Et.          | 1 | L | no data |
| 815 Bradley Ave          | 1 | L | no data |
| 4013 Brownell Blvd.      | 1 | L | C,P     |
| 2418 Gold Ave.           | 1 | L | no data |
| 626 Commonwealth Ave     | 1 | L | no data |
| 820 Stocker St.          | 1 | L | P       |
| 490 Westminster Ave.     | 1 | L | no data |
| 1623 Neome Dr.           | 1 | L | no data |
| 3802 Gorey Ave.          | 1 | L | no data |
| 1720 Davison Rd.         | 1 | L | no data |
| 2110 Mountain Ave.       | 1 | L | no data |
| 2008 Clement St.         | 1 | L | no data |
| 2028 Cornelia Rd.        | 1 | L | no data |
| 2828 Yale St.            | 1 | L | no data |
| 1914 W. Rome Ave.        | 1 | L | no data |
| 2920 N. Dexter St.       | 1 | S | no data |
| 2810 Keller Ave.         | 1 | L | no data |
| 3245 Montana Ave.        | 1 | L | no data |
| 3623 Norwood Dr.         | 1 | L | no data |
| 2801 Reynolds            | 1 | L | no data |
| 3518 Brandon St.         | 1 | L | no data |
| 2117 Stanford Ave.       | 1 | L | C,P     |
| 5886 Leslie Dr.          | 1 | L | no data |
| 1809 Mt. Rome Ave.       | 1 | L | no data |
| 1434 Stone St.           | 1 | L | no data |
| 2006 Atken Ave.          | 1 | L | no data |
| 3141 Wolcott             | 1 | L | no data |
| 883 Galaxy Ave.          | 1 | L | no data |
| 2808 Norfolk St.         | 1 | L | no data |
| 912 Crawford St.         | 1 | L | no data |
| 4024 Sterling            | 1 | L | no data |
| 3737 Worchester Dr.      | 1 | L | no data |
| 1725 Lincoln Ave.        | 1 | L | no data |
| 3199 Colorado            | 1 | L | no data |
| 1493 Galney Ave.         | 1 | L | no data |
| 2780 Coventry Ct.        | 1 | L | no data |
| 939 Frost St.            | 1 | L | P       |
| 2307 Radcliffe           | 1 | L | no data |
| 224 E. Court St.         | 1 | L | no data |
| 3440 Rangeley            | 1 | L | no data |
| 3808 Brownell Blvd.      | 1 | L | no data |
| 3006 Kensington          | 1 | L | no data |
| 2537 Delaware Ave.       | 1 | L | no data |
| 1810 W. Hobson Ave.      | 1 | L | no data |
| 5805 Leslie Dr.          | 1 | L | no data |
| 1721 Chelsea Circle      | 1 | L | no data |
| 812 Waldinga Ave.        | 1 | L | no data |
| 3082 Lanning Dr.         | 1 | L | no data |
| 25151 Chicago Blvd.      | 1 | L | no data |
| 742 Lincoln Ave.         | 1 | L | P       |
| 1805 Ramsey Blvd.        | 1 | L | no data |
| 1910 Ramsay Blvd.        | 1 | L | no data |
| 1911 Curry St..          | 1 | L | no data |
| 3507 Dearborn Ave.       | 1 | L | no data |
| 3829 Iambos Ave.         | 1 | L | no data |
| 1559 Chevrolet Ave       | 1 | L | no data |
| 2015 Added Data          |   |   |         |
| 1809 Stevenson St.       | 1 | L | P       |
| 5303 Custer Ave.         | 1 | L | C,P     |
| 481 E. Newall St.        | 1 | L | P       |
| 215 Browning Ave.        | 1 | L | C,P     |
| 2635 Trumbull Ave.       | 1 | L | C,P     |
| 201 Browning Ave.        | 1 | L | P       |
| 1224 Decker St.          | 1 | L | C,P     |
| 1220 Decker St.          | 1 | L | P       |
| 1379 Washington Ave.     | 1 | L | P       |
| 1383 Washington Ave.     | 1 | L | C,P     |
| 1372 Washington Ave.     | 1 | L | C,P     |
| 1967 Washington Ave.     | 1 | L | P       |
| 1701 Marquette Dr.       | 1 | L | C,P     |
| 778 Bundy Ave.           | 1 | L | P       |
| 3714 Beecher Rd.         | 1 | L | C       |
| 1016 Ingleside Ave.      | 1 | L | C,P     |
| 1818 Rock Creek Ln.      | 1 | L | C,P     |
| 3010 Cheyenne St.        | 1 | L | C,P     |
| 2406 Mountain Ave        | 1 | L | P       |
| 2020 Crooked Ln.         | 1 | L | C,P     |
| 310 E. Myers St.         | 1 | L | P       |
| 631 Alvord Ave.          | 1 | L | P       |
| 216 Browning Ave.        | 1 | L | C,P     |
| 3714 Beecher Rd.         | 1 | L | C,P     |
| 912 Lexington Ave.       | 1 | L | P       |
| 348 Robbie Ln.           | 1 | L | P       |
| 353 Robbie Ln.           | 1 | L | C,P     |
| 341 Robbie Ln.           | 1 | L | C,P     |
| 328 Robbie Ln.           | 1 | L | C,P     |
| 357 Robbie Ln.           | 1 | L | C       |
| 344 Robbie Ln.           | 1 | L | C,P     |
| 3807 Oak Ave.            | 1 | L | P       |
| 421 Lyon St.             | 1 | L | C,P     |
| 1528 Delaware Ave.       | 1 | L | P       |
| 3811 Brentwood Dr.       | 1 | L | P       |
| 1625 S. Franklin Ave.    | 1 | L | P       |
| 853 E. 7th St.           | 1 | L | C,P     |

[illegible]

September 10, 2014

Mr. Brent Wright  
City of Flint Water Treatment Plant  
4500 North Dort Highway  
Flint, Michigan 48505

SUBJECT: Compliance Communication  
Total Trihalomethane Operational Evaluation Requested

Under the Stage 2 Disinfectants and Disinfection Byproduct Rule, the City of Flint has been required to collect samples for the analysis of Total Trihalomethane (TTHM) and Haloacetic Acids (HAA5) at eight sites within the City's water distribution system. The City has completed two quarterly monitoring periods since changing its source water to the Flint River effective April 25, 2014.

Normally an Operational Evaluation Level (OEL) would be calculated in accordance with the Michigan Safe Drinking Water Act, Public Act 399, 1976, as amended, Administrative Rule 7196 (R 325.107196), each quarter once three quarters of results have been obtained and compared with the respective maximum contaminant level (MCL) for TTHM. Normally the calculation would be made as follows:

$$(2 \times \text{current quarter} + \text{sum of 2 previous quarters}) \text{ divided by } 4$$

As the City of Flint currently has only two quarters of data, the calculation has been modified as follows:

$$(2 \times \text{current quarter} + \text{previous quarter}) \text{ divided by } 4$$

The resulting OEL for each site is listed in the table below. All results are in parts per billion (ppb):

|     |                                               | TTHM    |         | RAA   |      | HAA5    |         |       |      |
|-----|-----------------------------------------------|---------|---------|-------|------|---------|---------|-------|------|
|     |                                               | 5/21/14 | 8/21/14 | 11/20 |      | 5/21/14 | 8/21/14 | 11/20 | RAA  |
| 364 | DBP1 McDonalds<br>3719 Davison                | 162.4   | 145.3   | 56.6  | 71.6 | 64      | 43      | 16    | 30.8 |
| 260 | DBP2 Liquor Palace<br>822 S. Dort Highway     | 111.6   | 112     | 36.2  | 6.5  | 52      | 40      | 21    | 28.3 |
| 257 | DBP3 North Flint Auto<br>3302 S. Dort Highway | 96.5    | 127.2   | 33.3  | 64.3 | 48      | 31      | 15    | 23.5 |
| 321 | DBP4 University Market<br>3606 Corunna        | 106.4   | 181.3   | 33.9  | 30.4 | 55      | 24      | 15    | 23.5 |
|     | DBP5 B&P Gas Station<br>2501 Flushing         | 75.1    | 196.2   | 33.6  | 71.2 | 38      | 17      | 24    | 19.8 |
|     | DBP6 Salem Housing<br>3216 MLK Boulevard      | 82.2    | 112.4   | 50.1  | 61.2 | 41      | 25      | 5     | 17.8 |
|     | DBP7 Kroger<br>5018 Clio Road                 | 88.2    | 144.4   | 53.6  | 71.6 | 49      | 30      | 17    | 21.8 |
|     | DBP8 Taco Bell<br>6204 N. Saginaw             | 79.2    | 118.3   | 41.1  | 59.7 | 50      | 37      | 18    | 26.3 |

## Briefing Paper for Call with MDEQ on July 21, 2015 MDEQ Implementation of LCR Rule and Flint Issues

### Issue #1: Is there a public health concern regarding lead in Flint or other regulatory requirements?

- Under State policy ODWMA-399-027, the wholesale system is responsible for corrosion control treatment. Detroit, as the wholesale system, was providing this for Flint. When Flint changed to no longer be a consecutive system, and instead using the Flint River as its water source, it did not begin its own corrosion control program and is not currently practicing corrosion control treatment at the Water Treatment Plant.
- Prior to the change from being a consecutive public water system to the Detroit Water and Sewerage Department (DWSD) system and associated switch in source water, the City of Flint was conducting LCR sampling every three years. Due to the switch in water sources, the Michigan Department of Environmental Management (MDEQ) required the City of Flint to increase the number of monitoring sites from 50 to 100 sites for two consecutive rounds of monitoring (July through December 2014 and January through June 2015). *60*
- The first round of samples after switch-over from DWSD (July 1, 2014 – Dec 31, 2014) had 90th percentiles of 6 ppb for Lead and 110 ppb for Copper. *11 ppb 2nd round*
- As of June 30, 2015, we believe MDEQ received all 100 sample results from the second round of monitoring and is incorporating citizen-requested sample results that meet the Tier 1 criteria. *✓*
- HQ confirmed, per the Water Supply Guidance #174 that citizen-requested sample results should be included in the 90<sup>th</sup> percentile calculations. *During Monitoring Round Paper Tier 1 collected Paper*
- We believe that the results of the two rounds of sampling will support an exceedance of 5 ug/l. This will result in the need for a corrosion control study, but not public education. *→ in LCR*
- Flint plans to switch to another source in 2016 making the corrosion control study timing complicated.
- Compliance with other regulatory requirements: Appears to be doing fine with Stage 2 DBP rule and re-characterizing the distribution system based on the new source of water, but not sure about LT2 compliance for first round monitoring for cryptosporidium. We'd want to ask if Flint had existing data on Crypto for the Flint River (they would be allowed to grandfather data for the 1<sup>st</sup> round of sampling). If not, they'd need to start sampling as soon as possible to get 1<sup>st</sup> round crypto results. If they did have old data, they'd still be expected to start a 2<sup>nd</sup> round of Crypto monitoring already (April 2015 – since Flint's population is still above 100,000). *October*

### Discussion Items:

- Discuss most recent 2 rounds of 6-months monitoring results and 90<sup>th</sup> percentile calculations and inclusion of the citizen-requested samples.
- Based on results, what are the next steps?
- Set the stage for why we are concerned about lead levels – since Flint is not feeding phosphate and the lead, phosphate, and cadmium are tracking, the phosphate is likely coming off the pipes.
- Is there anything we should do now to reduce the exposure risk to lead? *Not*
- Discuss possibly accelerating a corrosion control study for Flint. However, this should be done with a comprehensive look at all rule requirements and treatment needs. EPA/ORD expert are available to assist. *Not Miguel*
- How is Flint doing with meeting all the other regulatory requirements? Are they meeting LT2 requirements for crypto monitoring?

| Criteria for large systems (serving >50,000 persons) to install/maintain corrosion control treatment:           | Action Level (AL) Exceedance: If exceed Pb AL of 0.015 mg/L expressed as 90 <sup>th</sup> percentile level based on samples at tap:                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| If 90 <sup>th</sup> percentile tap lead value minus source water lead value greater than or equal to 0.005 mg/L | <ul style="list-style-type: none"> <li>• Corrosion control treatment steps</li> <li>• Source water treatment steps</li> <li>• Public education</li> <li>• Lead service line replacement (if continue to exceed Pb AL after installing treatment)</li> </ul> |

*- Study 18 months? to complete*



## Issue #2: Discuss optimal corrosion control requirements

- The federal regulations governing lead and copper in drinking water, which all States are required to adopt, require all large public water systems (those serving greater than 50,000 persons (Flint's population is 99,002 (2014))) to install and maintain optimal corrosion control. The federal citation (requirement) requiring optimal corrosion control treatment can be found at Title 40 Code of Federal Regulations (CFR), Subpart I, Section 141.80, paragraph (d), as follows:
  - "(d) Corrosion control treatment requirements.
  - (1) All water systems shall install and operate optimal corrosion control treatment as defined in 141.2.
  - (2) Any water system that complies with the applicable corrosion control treatment requirements specified by the State under 141.81 and 141.82 shall be deemed in compliance with the treatment requirement contained in paragraph (d)(1) of this section."
- Paragraph (1) above requires systems to have installed treatment unless they have low lead levels (defined in other parts of the rule), but based on the Flint's current 90th percentile lead level, they would not meet that criteria and must have optimal corrosion control in place. Title 40 CFR Section 141.2 defines optimal corrosion control treatment as follows:
  - "Optimal corrosion control treatment, for the purpose of subpart I of this part only, means the corrosion control treatment that minimizes the lead and copper concentrations at users' taps while insuring that the treatment does not cause the water system to violate any national primary drinking water regulations."
- HQ memorandum of January 10, 1992 titled, "Consecutive Systems Regulated under the National Primary Drinking Water Regulations for Lead and Copper" reinforces the position that "optimal corrosion control treatment is properly installed and maintained". Further, the LCR Short-term Revisions (2007) Preamble (starting on page 57788) states, "State notification and approval of long-term treatment changes is important because these changes could adversely impact optimal corrosion control. As EPA noted in the proposed rule, this approach allows the State to evaluate the change prior to implementation and, if needed, to design a monitoring program to ensure that optimal corrosion control is maintained after the change.... EPA will provide guidance to help systems identify source water changes (such as changing the mixture) that could impact optimal corrosion control."
- MDEQ's Policy also describes under 5.c. Change in Treatment or Addition of a New Source that "Field staff may require the water supply to conduct additional monitoring or take other actions to ensure that CCT (corrosion control treatment) remains optimized".

### Discussion Items:

- MDEQ made decision that Flint would be treated as a "new system" rather than an existing system changing their source of water. Discuss EPA (Region & HQ) interpretation of regulations that systems need to "maintain" corrosion control.
- Are there any other communities that may leave the Detroit system for other sources like Lake Huron that would be viewed as new systems or should be doing something about now to collect needed information to maintain corrosion control?



**Issue #3: Discuss Pre-flushing (as time allows)**

- Lead compliance sampling procedures in the state of Michigan comply with Federal SDWA requirements which calls for a minimum of 6 hours during which there is no water used from the tap the sample is taken from. While pre-flushing may fall within a strict legal interpretation of the regulations, we believe that it goes against the intent of the monitoring protocol, since it changes the normal water use of the homeowner in the sample.
- Michigan is the only Region 5 State that requires pre-flushing.
- Attachment 1 provides a brief description of pre-flushing.

## Pre-flushing

The issue of pre-flushing came up regarding compliance sampling protocol used in Washington DC and was addressed by Cynthia Dougherty/OGWDW(see below/attached docs) in a letter to a resident in DC. It was not addressed in the Grumbles memo as the pre-flushing was discovered after the Grumbles memo had been written. To date, it has not been addressed on a national basis but it is one of the issues being discussed as part of the LCR Long-term revisions.

*"The purpose of the monitoring protocol is to determine if corrosion control is effective in reducing lead and copper leaching at times and locations where we would expect levels to be greatest under normal conditions. Therefore, we believe that homeowners collecting samples should use their water as they would normally, with the exception that the regulations require the water to stagnate for a minimum of six hours prior to collection of the sample."*

*"We do not understand why DC WASA believes it should be necessary to request flushing only in households participating in the sampling. While this may fall within a strict legal interpretation of the regulations, we believe that it goes against the intent of the monitoring protocol, since it changes the normal water use of the homeowner in the sample. We will discuss this matter with their water quality manager to determine if there is a rationale that we should consider as we evaluate this issue. We also want to make sure that you are aware that we are considering additional actions we can take to further reduce lead and copper in drinking water and will be holding a stakeholder meeting on October 14-15 to initiate the effort."*

11/1/12  
from  
GEOC

Detail of Worst Case Cost Projections

Worse Case Scenario

Cost Comparisons: Water Supply to City of Flint from DWSD and proposed KWA project

Cost of Water to City of Flint (excluding Genesee) using continued service from DWSD

|                              |           | FY13         | FY14         | FY15         | FY16         | FY17         | FY18         | FY19         | FY20          |
|------------------------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| Fixed Cost (1)               |           | \$ 4,411,880 | \$ 4,852,848 | \$ 5,338,133 | \$ 5,871,948 | \$ 6,459,141 | \$ 7,105,655 | \$ 7,815,560 | \$ 8,587,116  |
|                              | Escalator | 1.1          | 1.15         | 1.15         | 1.15         | 1.15         | 1.15         | 1.15         | 1.15          |
| Commodity Cost (2)           |           | \$ 7,278,543 | \$ 7,540,472 | \$ 8,022,485 | \$ 8,423,620 | \$ 8,844,821 | \$ 9,287,041 | \$ 9,751,354 | \$ 10,238,553 |
|                              | Escalator | 1.05         | 1.05         | 1.05         | 1.05         | 1.05         | 1.05         | 1.05         | 1.05          |
| Flint WTP Operating Cost (3) |           | \$ 2,725,535 | \$ 2,881,815 | \$ 3,004,905 | \$ 3,155,151 | \$ 3,312,908 | \$ 3,478,554 | \$ 3,652,482 | \$ 3,835,106  |
|                              | Escalator | 1.05         | 1.05         | 1.05         | 1.05         | 1.05         | 1.05         | 1.05         | 1.05          |
| TOTAL                        |           | \$14,415,958 | \$15,275,136 | \$16,365,524 | \$17,450,717 | \$18,616,861 | \$19,870,650 | \$21,219,435 | \$22,671,185  |

(1) Per FY13 Budget and DWSD Contract, fixed charge from DWSD for FY13 is \$707,000 per month or \$8.5 million total. Flint's cost is 52% or \$4.4 million total.

(2) Per FY13 Budget and DWSD Contract, and based on 12 million gallons per day (mgd), cost is \$7.3 million, based on \$12.46/unit (\$12.46x1800unitsx365).

(3) Per FY13 Budget, annual cost of WTP is \$4.1 million. Genesee County pays \$1,385,000 for emergency back up service.

Cost of Water to City of Flint using proposed KWA project for water supply to Flint WTP

|                                       |           | FY13         | FY14         | FY15         | FY16          | FY17          | FY18          | FY19          | FY20         |
|---------------------------------------|-----------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|--------------|
| KWA Entry Costs (1)                   |           | \$ 581,400   | \$ 581,400   | \$ 581,400   | \$ -          | \$ -          | \$ -          | \$ -          | \$ -         |
| Fixed KWA Construction Cost (2)       |           |              |              |              | \$ 7,582,128  | \$ 7,582,128  | \$ 7,582,128  | \$ 7,582,128  | \$ 7,582,128 |
|                                       | Escalator |              |              |              | 1.05          | 1.05          | 1.05          | 1.05          | 1.05         |
| Fixed Flint WTP Construction Cost (3) |           |              |              |              | \$ 556,651    | \$ 556,651    | \$ 556,651    | \$ 556,651    | \$ 556,651   |
|                                       | Escalator |              |              |              | 1.05          | 1.05          | 1.05          | 1.05          | 1.05         |
| Flint WTP Operating Cost (4)          |           | \$ 5,911,538 | \$ 6,207,115 | \$ 6,517,471 | \$ 6,843,344  | \$ 7,186,511  | \$ 7,544,787  | \$ 7,922,028  | \$ 8,318,128 |
|                                       | Escalator | 1.05         | 1.05         | 1.05         | 1.05          | 1.05          | 1.05          | 1.05          | 1.05         |
| KWA Commodity Charge (5)              |           | \$ 759,260   | \$ 797,160   | \$ 837,018   | \$ 878,889    | \$ 922,812    | \$ 968,953    | \$ 1,017,401  | \$ 1,068,271 |
|                                       | Escalator | 1.05         | 1.05         | 1.05         | 1.05          | 1.05          | 1.05          | 1.05          | 1.05         |
| TOTAL                                 |           |              |              |              | \$ 16,347,103 | \$ 16,562,519 | \$ 17,078,206 | \$ 17,525,177 |              |

(1) The City will, upon joining, be required to pay a fee of \$92,300 per MGD for each year until bonding for the project is obtained. At 18MGD, the City's cost is \$581,000 annually. It is projected that fee will be assessed for 3 years.

Per KWA proposal, project cost is \$272 million; City's fixed cost would be 30% of debt service, based on capacity design of 30mgd, of which 18MGD is for Flint. Debt service is based on 5% interest rate @ 25 years; 5% added to principal for capitalized interest for FY13, FY14, and FY15. (\$272,421,588 plus \$13,521,070 for 3 years = \$313,284,752). The costs here are increased by 15%; debt service starts in FY16 but water is not available until FY17.

Per KWA proposal, the cost of upgrading the Flint is \$8 million. City's fixed cost would be 100% of debt service based on 5% interest rate @ 25 years, with 5% added to cover capitalized interest for FY13, FY14, and FY15. (total principal = \$8.8 million). Again, costs here are increased by 15%; debt service starts in FY16 but water is not available until FY17.

(4) Per FY13 Budget annual cost of WTP is \$4,111,538. \$1.6 million for electricity and chemicals & 2.5 FTE's are added. 100%.

(5) Per KWA proposal, initial commodity charge would be based on \$1.30/unit or 7,500 gallons. Charge is based on 12MGD.

**Thelen, Mary Beth (DEQ)**

**From:** Wyant, Dan (DEQ)  
**Sent:** Monday, September 28, 2015 7:18 AM  
**To:** Muchmore, Dennis (GOV); Lyon, Nick (DCH); Hollins, Harvey (GOV)  
**Cc:** Wurfel, Sara (GOV); Wurfel, Sara (GOV); Lasher, GERALYN (DCH); Thelen, Mary Beth (DEQ)  
**Subject:** Proposed Press Conference on Flint Drinking Water

Per the ongoing issues in Flint concerning their drinking water, I would offer the following recommendations. Let's discuss.

**Recommendation**

Press Conference in Flint – Wednesday, Thursday or Friday.

**Participants**

Mayor of Flint  
Dan Wyant – Michigan Department of Environmental Quality  
Nick Lyon – Department of Community Health  
Susan Hedman – Region 5 Administrator or EPA  
Harvey Hollins – Governor's office  
Local Public Health Department

**Announcement**

Federal – State – Local action plan to address Flint Drinking Water

1. Governor Snyder names Dr. Dean Sienko as Flint drinking water Public Health Advisor. *Public Health Medical Officer*
2. ~~All~~ Flint schools water will immediately be tested to ensure that drinking water is safe. *Not likely? Copper at schools?*
3. Advisories will be disseminated recommending citizens flush your cold water pipes, use only water from the cold water tap for drinking, cooking and especially for making baby formula.
4. Implementation of fully optimized corrosion controls in the Flint drinking water system.
5. Expanded water testing of at risk properties. *More*
6. Offer water testing at no cost to Flint residents to assure water is safe. *360 min? If so why?*
7. Convene a safe drinking water "Technical Review Advisory" to ensure best technology, practices and science is being utilized, including EPA's expertise and assistance from their Office of Research and Development. *Someone will attend*
8. Offer bottled water and premixed formula if test results indicate high levels of lead. *W.C. State*
9. Accelerate water system improvements to address replacement of lead service lines. *WM?*

*CIP? \$730K  
1/20/16  
2015-2018*

*San Antonio  
-GS  
-training*

*Flint Spent?*

Dan Wyant, Director  
Department of Environmental Quality  
517-284-6700 (New Number)

## Response to Corrosion Control Questions

- Lime Softening can affect the pH in water
- The pH of the water is one physical characteristic that can affect the leaching of lead from pipes into the water
- As per the requirements in the Lead/Copper rule the Flint Water system was evaluated for two consecutive monitoring periods and the results of the monitoring demonstrated that further action was necessary.
- The DEQ promptly notified the Flint water system of the need for additional measures and the city of Flint promptly began putting together an action plan to address this need.

Supplement for Flint Drinking Water Events  
January 12, 2016

| Date                            | Event                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| June 30 to<br>July 21, 2015     | The MDEQ had determined that optimization of Flint River water was required, but the U.S. Environmental Protection Agency (U.S. EPA) was unavailable to review the issue with the MDEQ until July 21, 2015. During this period, the MDEQ concentrated their analysis of changes necessary to add the corrosion control optimization for Flint River water.                                                             |
| July 21, 2015                   | The U.S. EPA did not provide a definitive answer to the Lead and Copper Rule requirements until November 3, 2015.                                                                                                                                                                                                                                                                                                      |
| August 17, 2015                 | The MDEQ notified Flint by letter requiring optimization despite the U.S. EPA's delays relative to information regarding the Lead and Copper Rule (see attached).                                                                                                                                                                                                                                                      |
| August 31, 2015                 | A conference call was held with the U.S. EPA on lead issues to determine what Flint should engineer to provide optimization to Flint River water.                                                                                                                                                                                                                                                                      |
| August 31 to<br>October 1, 2015 | The MDEQ was developing a construction permit for the corrosion control optimization of Flint River water.                                                                                                                                                                                                                                                                                                             |
| October 6, 2015                 | The MDEQ attended the Technical Advisory Committee (TAC) meeting in Flint, at which the TAC recommended a return to Detroit Water and Sewerage Department (DWSD) water.                                                                                                                                                                                                                                                |
| October 9, 2015                 | Subsequent to the Governor's press conference indicating that Flint would return to the Great Lakes Water Authority (i.e., DWSD) water, the MDEQ began work with the city of Flint to evaluate procedures to bring DWSD water back online to the city of Flint.                                                                                                                                                        |
| October 17, 2015                | With DWSD water returning to the city of Flint, the MDEQ required additional phosphate treatment of the already optimized DWSD water. The construction permit for this corrosion control optimization was then issued on October 28, 2015.                                                                                                                                                                             |
| October 22, 2015                | The MDEQ began work with the U.S. EPA to begin evaluating required sampling protocols with the U.S. EPA's Flint Safe Drinking Water Task Force. Protocols were established for school sampling, for household sampling where children had in excess of 5 ppb per deciliter of lead, and for future Lead and Copper Rule compliance. All of these protocols have been completed and approved by the U.S. EPA, Region 5. |
| October 23, 2015                | With the school sampling protocol complete, plumbing assessments were conducted each Friday of the schools to be sampled on Saturday within the months of October, November, and December. Upon completion of the sampling, data was reduced and reports are in the process of being developed for each school building.                                                                                               |



# OAG

Office of the Auditor General

201 N. Washington Square, Sixth Floor • Lansing, Michigan 48913 • Phone: (517) 334-8050 • [www.audgen.michigan.gov](http://www.audgen.michigan.gov)

**Doug A. Ringler, CPA, CIA**  
Auditor General

December 23, 2015

The Honorable Jim Ananich  
Senate Minority Leader  
State Capitol, Room S-105  
Lansing, Michigan

Dear Senator Ananich:

Enclosed are answers to the questions you posed in your October 20, 2015 letter to our office regarding the audit we are conducting of the Office of Drinking Water and Municipal Assistance (ODWMA), Department of Environmental Quality (DEQ), specific to lead contamination in the City of Flint's drinking water. Also enclosed are additional questions we developed that are relevant to these issues, along with five exhibits:

- A map showing Flint water samples by zip code.
- A map showing lead counts of 5 parts per billion or higher.
- Two charts showing the number of samples by time period and zip code.
- A time line of the Flint water review.

We appreciate the opportunity to assist you in answering questions regarding this topic. If you have further questions or a request for other services, please do not hesitate to contact our office.

Sincerely,

Doug Ringler  
Auditor General

Enclosures





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## Questions and Answers

**Q1: How does ODWMA ensure the data it receives is accurate?**

**A:** With regard to the United States Environmental Protection Agency (EPA) Lead and Copper Rule (LCR) monitoring requirements, DEQ relies on the following key controls to ensure the accuracy of test results:

- State-owned laboratories test water samples.
- State-owned laboratories send test results directly to DEQ.
- The City of Flint Water Treatment Plant (Flint WTP) certifies whether sample sites are classified as tier 1\*.

The current Flint WTP LCR sampling process includes:

1. DEQ informs the Flint WTP of the required water lead and copper sample size.
2. The Flint WTP determines the pool of tier 1 sites for sampling.
3. The Flint WTP selects the sample.
4. The Flint WTP sends out sample kits and instructions to residents for collecting water samples.
5. Residents leave samples and signed sampling forms outside their front doors.
6. The Flint WTP employee picks up samples and forms from residents.
7. The Flint WTP employee reviews sample forms for completeness.
8. The Flint WTP employee sends samples to the State-owned laboratories.
9. State-owned laboratories test samples and provide results directly to DEQ.
10. DEQ receives water lead and copper sample results, which include the following information: date collected, date received, address where collected, type of residence (e.g., single family or apartment), and sample point (e.g., kitchen sink or bathroom sink).
11. DEQ tracks, and follows up if necessary, the number of samples collected by the Flint WTP to help ensure that the required minimum number of samples are collected by the monitoring period deadline.

---

\* Single-family or multiple-family residence with lead service line, lead solder copper piping constructed after 1982, or lead plumbing.

12. The Flint WTP submits lead and copper report to DEQ that certifies whether sample sites meet tier 1 criteria.

13. DEQ prepares the LCR 90th percentile calculation report.

During our review, we noted two potential improvements for the Flint WTP sampling process (see Question 5 of the additional questions answered by the OAG regarding tier 1 sample validity):

- DEQ could verify that the sampling pool was limited to only tier 1 sample sites to ensure that the Flint WTP is in compliance with the LCR (Title 40, Part 141, section 86(a)(3) of the *Code of Federal Regulations* [CFR]).
- DEQ could independently verify the validity of sample site certifications.

**Q2: What accountability measures are in place for ODWMA staff who fail to follow data verification protocols?**

A: DEQ does not provide any direct oversight over the Flint WTP and, therefore, does not have any accountability measures over the Flint WTP's LCR data verification protocols. DEQ's data verification protocol for lead and copper water sampling is limited to verification that the WTP certifies samples submitted to the State-owned laboratories for analysis (see steps 7 and 12 in the Flint WTP LCR sampling process noted in Question 1 above). We did not identify any instances in which ODWMA staff failed to verify that submitted samples were certified by the Flint WTP.

**Q3: What accountability measures are in place for ODWMA staff who lie or misrepresent information to the EPA?**

A: As with all classified employees, ODWMA staff must adhere to the rules and regulations established by the Michigan Civil Service Commission. If any ODWMA staff were determined to misrepresent information to the EPA, they would be subject to Civil Service Rule 2-6, Discipline, which allows an appointing authority to discipline an employee for just cause up to and including dismissal. We are not aware of any DEQ-established measures that are in addition to the Civil Service Rules.

We gained access to the e-mail accounts of key DEQ management (DEQ Director, Deputy Director, ODWMA Chief, and other key ODWMA staff) extending back to January 1, 2013. We did so to identify the key decision points and conversations that occurred leading up to and through the situation in Flint. Our review was also intended to determine whether State, Flint, or other officials attempted to conceal key test results or other information.

We noted one e-mail exchange between DEQ and the EPA that appears to be a significant contributor to the concern that DEQ misrepresented information to the EPA. The EPA requested clarification on February 26, 2015 regarding the type of optimized corrosion control **treatment** the Flint WTP was using. DEQ responded on February 27, 2015 that the city had an optimized corrosion control **program** in place, but DEQ did not provide any program details. DEQ informed us that the Flint WTP corrosion control **program** included performing

lead and copper monitoring for two consecutive six-month periods to determine whether corrosion control **treatment** would be necessary in the future. However, it appears the EPA interpreted corrosion control **program** to mean that corrosion control **treatment** was being performed.

On April 23, 2015, the EPA again inquired as to what the Flint WTP was doing for corrosion control **treatment**. DEQ responded on April 24, 2015 that the Flint WTP was not practicing corrosion control **treatment**.

Based on our review of this and other e-mails, we have no specific reason to believe that DEQ willfully misrepresented the information to the EPA.

**Q4: What policies do DEQ and ODWMA have in place to escalate major infractions up the chain of command?**

A: We did not note any instances of major infractions (i.e., intentional disregard of policies, laws, regulations or specific directions) committed by DEQ staff during the course of our review. DEQ does not have a formal policy or procedure in place to escalate major infractions performed by ODWMA employees; however, our review of DEQ correspondence confirmed the escalation of key issues up the chain of command related to the Flint situation. DEQ stated that its informal policy is for staff to notify the proper level of management of infractions to determine necessary action.



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## Additional Questions Answered by the OAG

### Application of the LCR

**Q1: How did the Flint WTP become the primary water supplier for the City of Flint?**

A: Upon notification of the City of Flint's plans to switch to the Karegnondi Water Authority (KWA) in April 2013, the Detroit Water and Sewerage Department (DWSD) submitted a letter to the City of Flint stating that it would terminate its agreement to provide water services on April 17, 2014.

According to DEQ management, the Flint WTP attempted to negotiate with the DWSD to maintain it as the City of Flint water supplier; however, after negotiations were unsuccessful, the City of Flint notified DEQ through a permit request of its intent to operate the Flint WTP full time using the Flint River. Although the Flint City Council voted in March 2013 in support of moving to the KWA pipeline, the vote was silent on the use of the Flint River as a temporary drinking water source.

DEQ informed us that in the 1990s, the City of Flint upgraded the Flint WTP to serve as a backup source of water for emergencies. In 2006, the Flint WTP began quarterly testing of the treated Flint River water at the Flint WTP to ensure water quality standards were met; however, the Flint WTP did not test the water's effect on the distribution system at consumer tap locations.

**Q2. Did DEQ consult with the EPA prior to determining how to apply the LCR?**

A: DEQ did not consult with the EPA on how to apply the LCR prior to implementing two consecutive six-month monitoring periods of the Flint WTP beginning July 1, 2014. Based on past experiences applying the LCR monitoring requirements, DEQ believed that it had appropriately applied the LCR requirements of a large water system.

**Q3: When Flint switched to the Flint River water source, should corrosion control treatment have been maintained?**

A: We believe that corrosion control treatment should have been maintained.

According to the LCR, a water system can achieve optimized corrosion control if it submits results of tap water monitoring for two consecutive six-month monitoring periods with acceptable lead levels. However, a water system that has optimized corrosion control, and which has treatment in place, should continue to operate and maintain optimal corrosion control treatment.

DEQ staff explained that they did not treat the switch to Flint River water as a new system, but as a new source. DEQ further stated that because the Flint River was a new water source and there was a change in chemicals needed to treat the new source, a corrosion control study was needed to determine the impact on the water distribution system. Therefore, it was DEQ's interpretation that two rounds of six-month monitoring were still needed to evaluate the water quality and determine optimal corrosion control treatment.

The Flint water system had optimal corrosion control treatment when the DWSD WTP was the water supplier. Based on our review of notes from a July 21, 2015 EPA and DEQ conference call on DEQ's implementation of the LCR regarding whether the Flint WTP should have continued to maintain corrosion control treatment, it appeared that the EPA did not agree with DEQ's interpretation of the LCR. Region 5 EPA staff explained that they would talk to the EPA headquarters about the interpretation of regulations and believes that systems that have been deemed optimized need to "maintain" corrosion control. The Region agreed to provide supporting regulatory citations for the language about maintaining corrosion control.

On November 3, 2015, the EPA issued a memorandum stating that the LCR had differing possible interpretations; however, the EPA concluded that it is important for large water systems to take the steps necessary to ensure that appropriate corrosion control treatment is maintained at all times, thus ensuring that public health is protected. Based on this clarification, it appears that corrosion control treatment should have been maintained.

**Q4: Should DEQ have required the Flint WTP to start pursuing optimized corrosion control treatment after the first round of six-month sampling results were above the lead action level of 5 parts per billion (ppb)?**

A: Yes. According to DEQ's application of the LCR, within six months after the end of the monitoring period in which the water sample results exceeded the acceptable lead level, DEQ should have required the Flint WTP to start pursuing optimized corrosion control treatment.

The LCR states that the lead action level is exceeded if the lead level, as determined by the 90th percentile calculation, is greater than 15 ppb. If the lead action level is exceeded, water systems are required to take additional actions including educating the public about lead in drinking water as well as commencing lead service line replacement if the water system has already installed corrosion control and/or source water treatment. However, for water systems that have not yet implemented corrosion control treatment, they can be deemed to have optimized corrosion control without installing treatment if they can demonstrate lead levels below 5 ppb for two consecutive six-month periods.

The first round of six-month sampling results was received in late March 2015. Because the results were 1 ppb over the lead action level of 5 ppb, DEQ would not be able to achieve two consecutive six-month periods below 5 ppb. Therefore, DEQ should have notified the Flint WTP to start pursuing optimized corrosion control treatment. However, DEQ waited until the second round of sampling was completed (June 30, 2015) to assess whether water sample results improved.

#### **Water Samples**

**Q5: Did DEQ verify that only tier 1 sample sites were selected by the Flint WTP in the two rounds of six-month samples?**

A: DEQ did not verify that only tier 1 sample sites were selected. DEQ relies on the Flint WTP's certification of sample sites and does not perform any independent verification of those certifications.

In a November 19, 2015 *Flint Journal* article, the Flint WTP indicated that it did not have the ability to ensure that all sites were tier 1. In fact, water samples came from the random distribution of 175 testing bottles without regard for whether the homes were at risk for high lead levels. DEQ issued a formal memorandum on November 9, 2015 requesting that the Flint WTP verify the classification of all prior sample items. The results are due back from the Flint WTP on December 30, 2015.

**Q6: DEQ dropped two water sampling sites from its second six-month sample (January 1, 2015 through June 30, 2015). Was this appropriate?**

**A:** Yes, it was appropriate for DEQ to drop these two water sampling sites. Federal regulation 40 *CFR* 141.86(a) states:

" . . . each water system shall complete a materials evaluation of its distribution system in order to identify a pool of targeted sampling sites that meets the requirements of this section . . . All sites from which first draw samples are collected shall be selected from this pool . . . Sampling sites may not include faucets that have point-of-use or point-of-entry treatment devices designed to remove inorganic contaminants."

This regulation also requires that a water system's targeted sampling pool consist of only tier 1 sampling sites if an adequate number is available to meet monitoring requirements.

According to federal regulation 40 *CFR* 141.86(f), the State may invalidate a water sample if it determines that the sample was taken from a site that did not meet the site selection criteria. A sample invalidated per this regulation does not count toward determining lead or copper 90th percentile levels or toward meeting the minimum monitoring requirements.

DEQ dropped one water sample site from its 90th percentile calculations because the site was from a business that does not meet the tier 1 requirements of being a single-family or multiple-family residence. The second sample site was dropped because the home had a point-of-entry treatment device to filter contaminants. Based on the criteria specified above, it appears that DEQ's rationale for dropping the samples from these two sites appropriately met the requirements for invalidating samples per federal regulation 40 *CFR* 141.86.

**Q7: Was flushing of the taps the night before drawing a sample an appropriate sample methodology?**

**A:** Yes. The LCR requires that samples be a first draw of water after six hours of stagnation. The LCR does not indicate whether or not the water line should be flushed prior to collecting the sample. In the sample instructions, DEQ required preflushing to ensure that sampled faucets were not stagnant for an excessive period of time beyond the targeted six hours (e.g., rarely used faucets or when a homeowner has been gone for an extended period of time.)

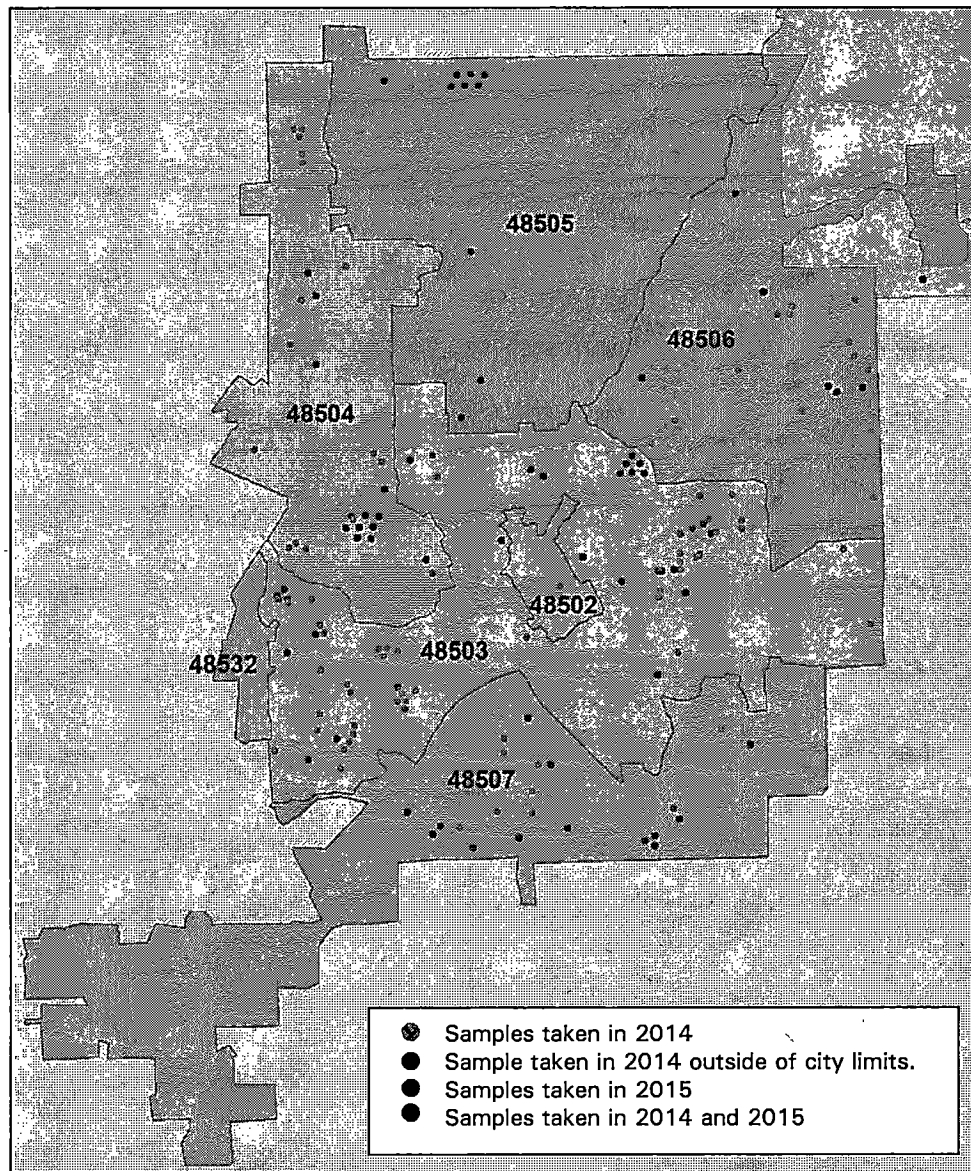
The LCR requires six hours of stagnation; however, it does not preclude DEQ from instructing residents to flush prior to stagnation.



## Flint WTP 2014 and 2015 Sample Locations (Exhibit #1)

In calendar year 1992, the Flint WTP established a tier 1 sample site pool for LCR monitoring. With the change to the Flint River water, the Flint WTP needed to increase the pool of sample locations because of additional sampling requirements. The following exhibit documents the 2014 and 2015 sample locations for LCR monitoring. Based on the data obtained during our review, we could not determine how the locations were selected or whether they were properly classified as tier 1 sample sites.

As noted in Question 5 of the additional questions answered by the OAG, DEQ has requested the Flint WTP to verify the tier 1 classification of all prior sample items.



Source: The OAG prepared this map using data obtained from DEQ and ©OpenStreetMap contributors (opendatacommons.org). The sample locations are approximate.

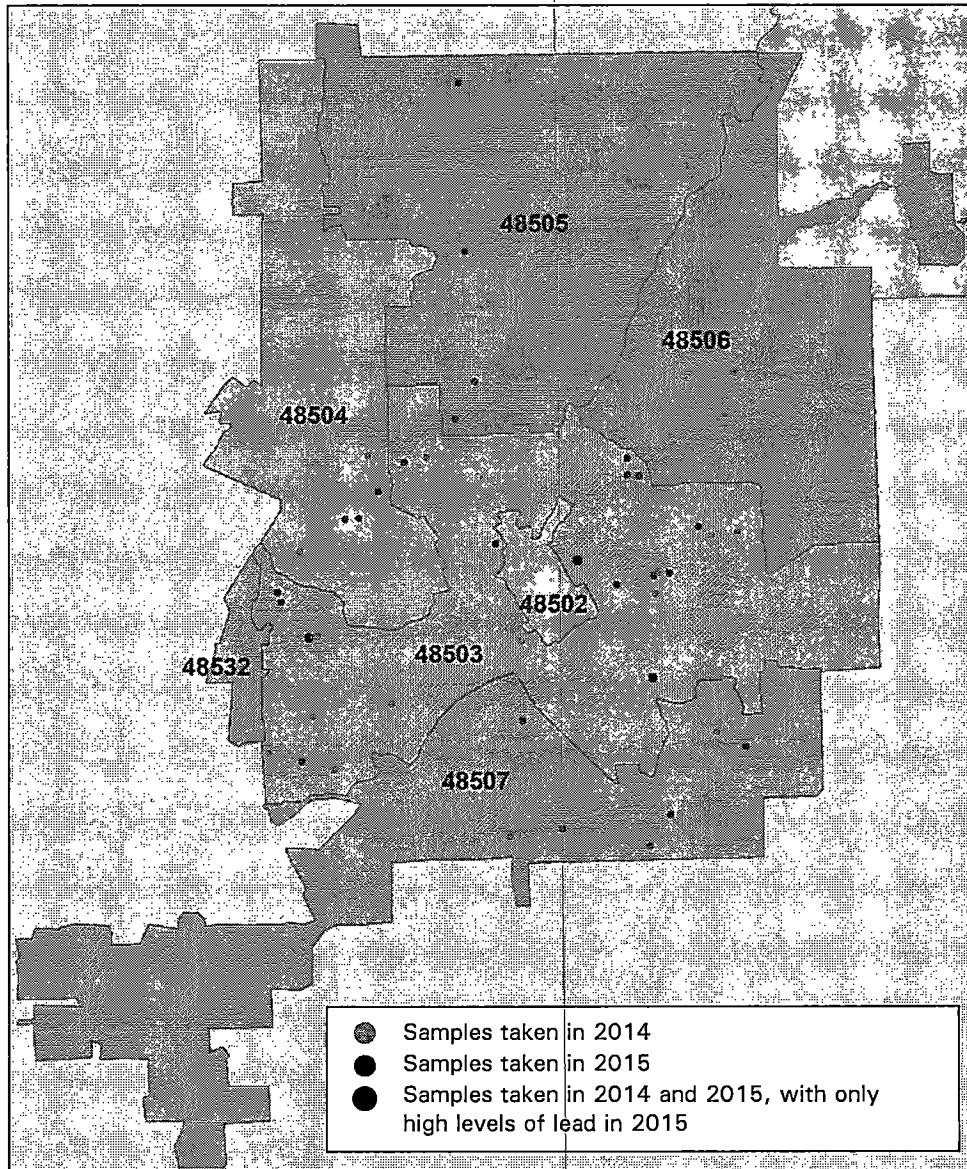


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## Flint WTP 2014 and 2015 Sample Locations With Lead Counts of 5 Parts Per Billion or Higher (Exhibit #2)

This exhibit documents the 2014 and 2015 sample locations with lead counts of 5 ppb or higher. This information is used in aggregate by DEQ to determine if the city has optimized lead levels.

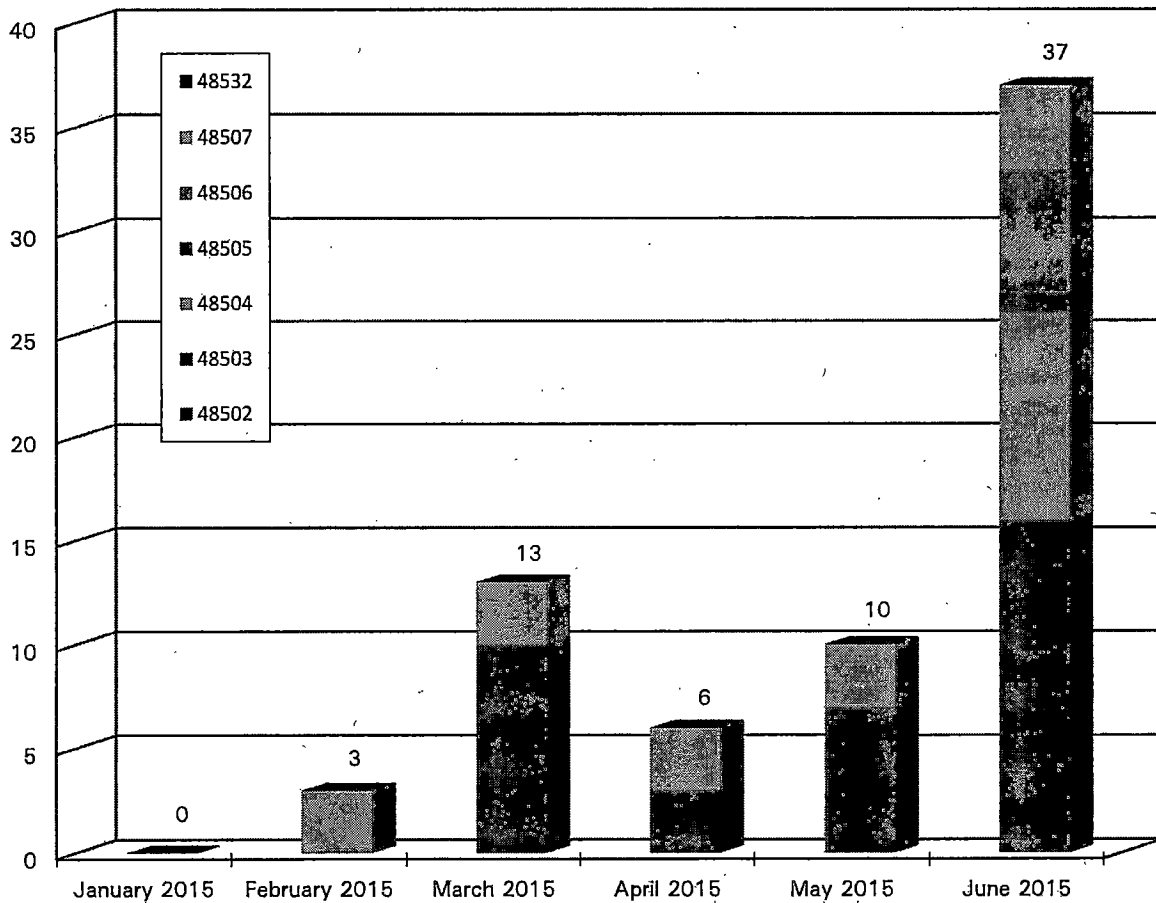


Source: The OAG prepared this map using data obtained from DEQ and ©OpenStreetMap contributors (opendatacommons.org). The sample locations are approximate.





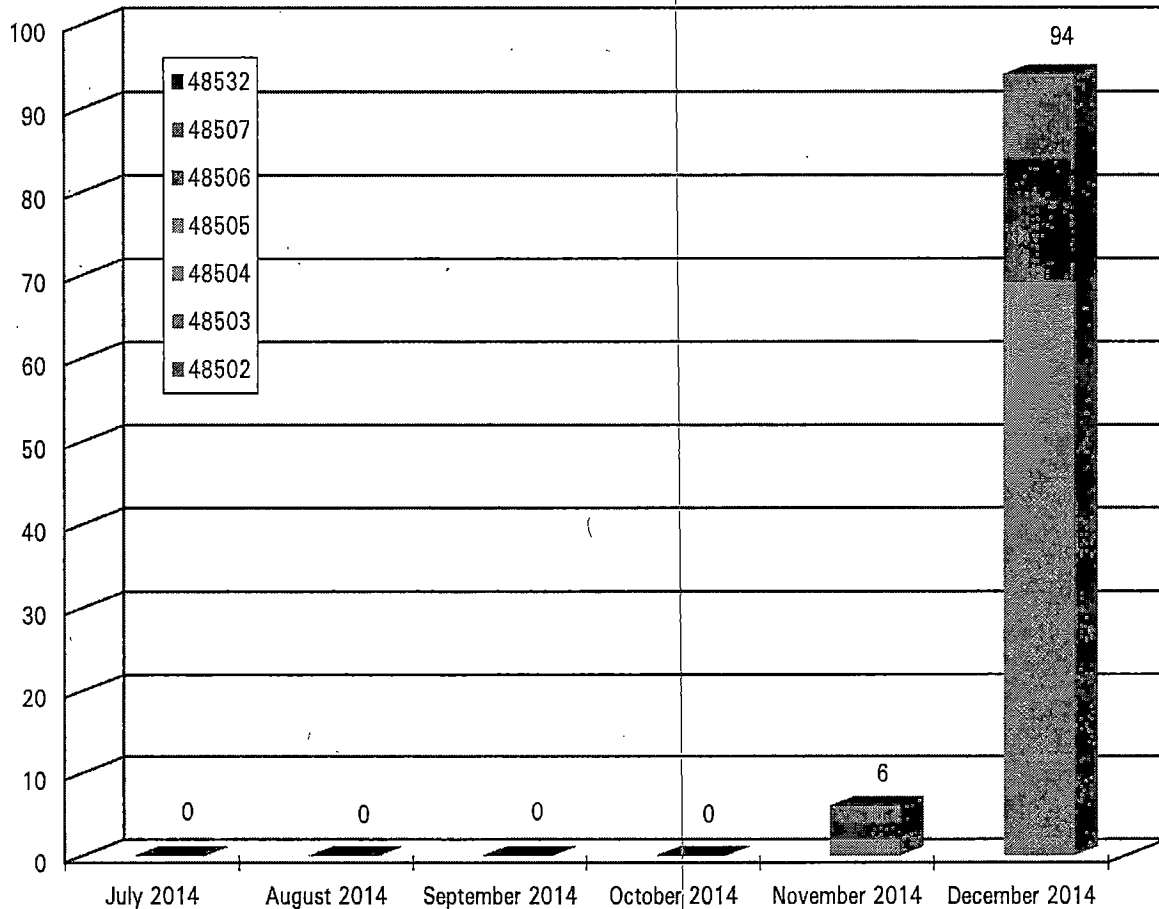
This chart expands on Exhibit #1 to show a summary by zip code and time of selection within the sampling period. Based on the data obtained during our review, we could not determine if the lateness of selection within the monitoring period affected the appropriateness of the sample items.



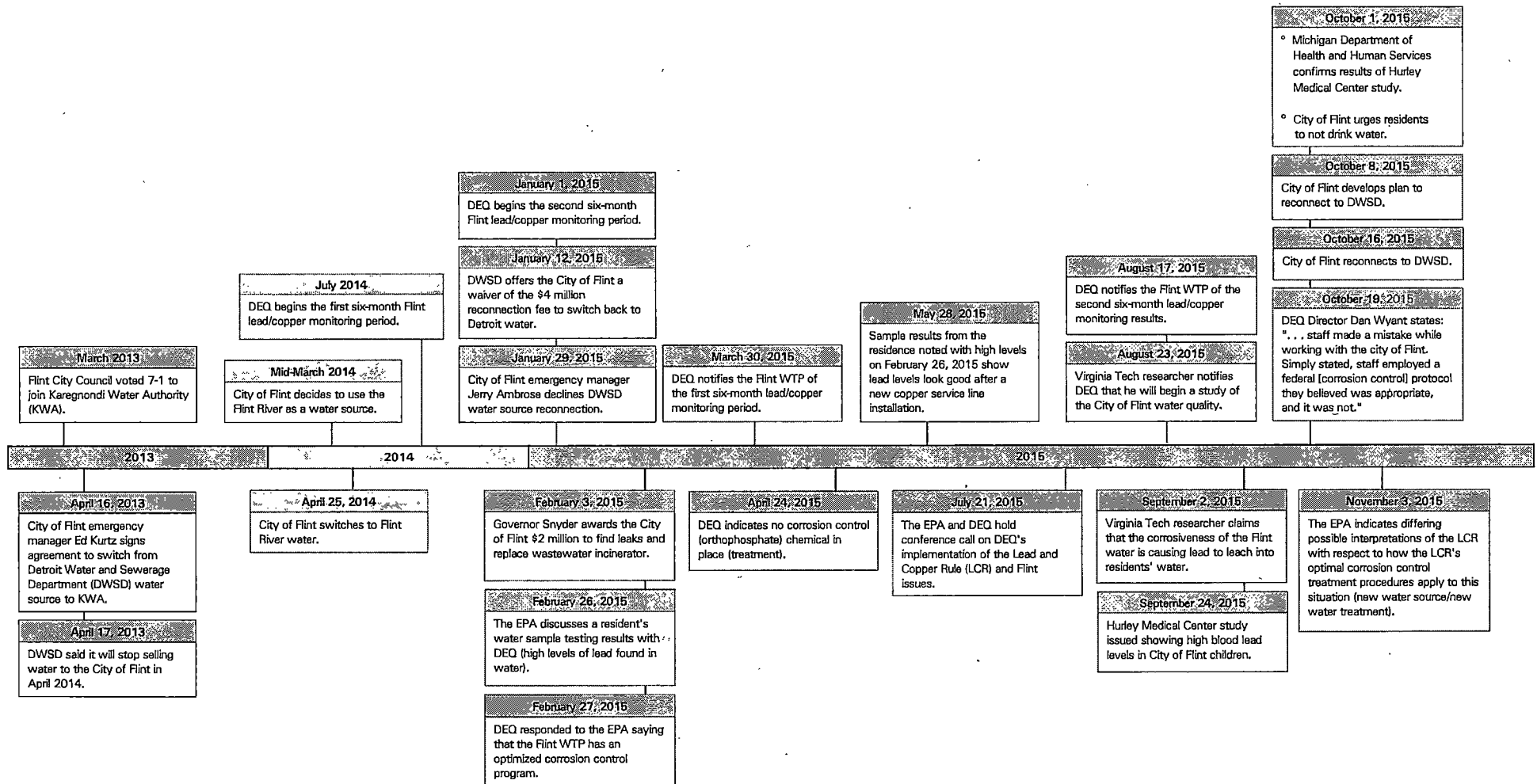
Source: The OAG prepared this chart using data obtained from DEQ.



This chart expands on Exhibit #1 to show a summary by zip code and time of selection within the sampling period. Based on the data obtained during our review, we could not determine if the lateness of selection within the monitoring period affected the appropriateness of the sample items.



Source: The OAG prepared this chart using data obtained from DEQ.



Source: The OAG prepared this time line using data (e-mails, meeting notes, and letters) obtained from DEQ, newspaper and press release articles, the Flintwaterstudy.org, and the Hurley Medical Center survey results.



## City of Flint

### Public Forum

Wednesday January 21, 2015

7:00 pm City Hall Dome

### AGENDA

#### **Opening**      COF – DPW Director - Howard Croft

- Forum Ground Rules (disorderly conduct will not be tolerated)
- Overview of Format (each guest to speak for ~10 minutes with written questions afterword)
- Recognition of Officials
- Introduction of Guests

#### **1<sup>st</sup> Speaker**      DEQ – Local Representatives - Mike Prysby, Steve Busch

- Role of DEQ
- Explanation of TTHM violation

#### **2<sup>nd</sup> Speaker**      LAN – Lead Engineer - Warren Green

- Discuss Engineering role
- Discuss Operational Evaluation Report

#### **3<sup>rd</sup> Speaker**      MSU Microbiologist – Dr. Joan Rose

- Risk Assessment (what do the numbers mean?)
- What to do if someone suspects they are at risk
- What about the elderly and those with a weak immune system
- What will the next violation mean (water is still safe)

#### **4<sup>th</sup> Speaker**      GCDC – Jeff Wright

- What to expect from KWA raw water as source
- Update on KWA timeline

#### **Final**      COF – DPW Director – Howard Croft

- Summary (Next Steps – Action Plans)
  - Hiring an industry expert
  - Tours of Treatment Plant
  - Continued communication
  - Planned steps (CIP built on, Water Reliability Study, Operational Evaluation Report)
  - Funding (researching all sources, state funding, federal opportunities)
  - Water & sewer rates (budgetary evaluation upcoming)
- Questions (Expected to have an hour of panel response time)
- Conclusion - Thank the panel, (Additional follow up at next Public Works Committee meeting)

## **Department of Environmental Quality (DEQ)**

**Michael Prysby, P.E.**

District Engineer

**Stephen Busch, P.E.**

Lansing and Jackson District Supervisor

## **Lockwood, Andrews, and Newnam (LAN)**

**J. Warren Green, PE**

Senior Associate, Director of Engineering

Warren has more than 30 years of experience in engineering management and supervision of complex water treatment and transmission facilities projects. He has successfully guided water system improvements through all necessary phases including feasibility studies, pilot testing, design, financial evaluation, land acquisition, construction, start-up and operation. His expertise is in the areas of facilities design, construction management and contract administration.

He has worked with several municipal utility clients throughout Illinois, Mississippi, Michigan and Wisconsin. He worked with the Green Bay Water Utility in Green Bay, Wis., for 12 years, serving as a project manager for a number of design and contract administration tasks. These included the expansion of a 10-mgd raw water pumping station, construction of approximately 17 miles of 54-in. steel water transmission main, and expansion of its water treatment plant in 1997 and 2004. He also oversaw a \$376 million project in DuPage County, Ill., where he was responsible for contract administration and construction management of 140 miles of water transmission mains.

## **MSU Water Quality and Environmental Microbiology Laboratory**

**Dr. Joan B. Rose, Ph.D.**

Laboratory Director/Principal Investigator

Homer Nowlin Chair in Water Research

Co-Director Center for Water Sciences

Co-Director Center for Advancing Microbial Risk Assessment

Joan is an international expert in water microbiology, water quality and public health safety and is a member of the National Academy of Engineering. She has been involved in the investigation of numerous waterborne outbreaks world-wide. Her work addresses the use of new tools for surveying and mapping water pollution for recreational and drinking water; assessment of water treatment technology and use of risk assessment.

### **Degrees:**

- Bachelor's (1976) and Ph.D. (1985), microbiology, University of Arizona
- Master's (1980) microbiology, University of Wyoming

## **Genesee County Drain Commissioner**

**Jeff Wright**

Past positions include:

- Chief Executive Officer of Karegnondi Water Authority
- Legislative Committee and Executive Board of Michigan Association of County Drain Commissioners
- Northeast District Chairman – Michigan Association of County Drain Commissioners
- Former Secretary/Treasurer – Michigan Association of County Drain Commissioners

11/1/12  
for  
C.O.C.

**WORSE CASE SCENARIO**  
**SUMMARY COMPARISON: KWA V DWSD**  
**(15% Cost Overrun: One year delay in Water Supply delivery)**

**Water and Sewer Cash Flow with KWA**

|                           | Year 1<br>FY13      | Year 2<br>FY14      | Year 3<br>FY15      | Year 4<br>FY16      | Year 5<br>FY17      | Year 6<br>FY18      | Year 7<br>FY19      | Year 8<br>FY20      |
|---------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Current DWSD & FWTP Costs | \$14,413,858        | \$15,355,135        | \$16,365,934        | \$17,450,717        | \$ -                | \$ -                | \$ -                | \$ -                |
| KWA Entry Fee             | \$ 581,400          | \$ 581,400          | \$ 581,400          | \$ -                | \$ -                | \$ -                | \$ -                | \$ -                |
| KWA Debt                  | \$ -                | \$ -                | \$ -                | \$ 7,582,128        | \$ 7,582,128        | \$ 7,582,128        | \$ 7,582,128        | \$ 7,582,128        |
| FWTP Debt                 | \$ -                | \$ -                | \$ -                | \$ 555,551          | \$ 555,551          | \$ 555,551          | \$ 555,551          | \$ 555,551          |
| KWA operations            | \$ -                | \$ -                | \$ -                | \$ -                | \$ 922,812          | \$ 988,853          | \$ 1,017,401        | \$ 1,068,271        |
| FWTP operations w KWA     | \$ -                | \$ -                | \$ -                | \$ -                | \$ 7,185,511        | \$ 7,544,787        | \$ 7,932,028        | \$ 8,318,128        |
| <b>TOTAL COSTS</b>        | <b>\$14,995,258</b> | <b>\$15,936,535</b> | <b>\$16,946,934</b> | <b>\$25,032,496</b> | <b>\$15,247,103</b> | <b>\$16,662,519</b> | <b>\$17,078,206</b> | <b>\$17,825,177</b> |

Include  
6% Rep. Costs

**Water and Sewer Cash Flow with DWSD**

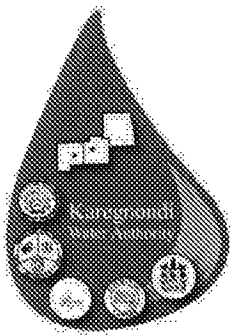
|                           | Year 1<br>FY13 | Year 2<br>FY14 | Year 3<br>FY15 | Year 4<br>FY16 | Year 5<br>FY17 | Year 6<br>FY18 | Year 7<br>FY19 | Year 8<br>FY20 |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Current DWSD & FWTP Costs | \$14,413,858   | \$15,355,135   | \$16,365,934   | \$17,450,717   | \$18,616,851   | \$19,870,650   | \$21,219,435   | \$22,671,185   |

**Cash Flow Difference: KWA and DWSD**

|                   | Year 1<br>FY13 | Year 2<br>FY14 | Year 3<br>FY15 | Year 4<br>FY16 | Year 5<br>FY17 | Year 6<br>FY18 | Year 7<br>FY19 | Year 8<br>FY20 |
|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Annual KWA - DWSD | \$ (581,400)   | \$ (581,400)   | \$ (581,400)   | \$ (8,138,779) | \$ 3,369,748   | \$ 3,218,131   | \$ 4,141,228   | \$ 5,148,008   |
| Cumulative        | \$ (581,400)   | \$ (1,162,800) | \$ (1,744,200) | \$ (9,882,979) | \$ (7,513,231) | \$ (4,295,100) | \$ (153,871)   | \$ 4,392,137   |

"Worse Case" scenario differs from Original in these respects:

- Delivery of water to Flint from KWA is delayed by one year and construction costs are 15% above the original projection.
- (1) Consequently, the City is required to begin paying for debt service one year before KWA begins delivery of water. This is in addition to its obligation to pay its entry fee of \$581,000 annually for the first 3 years.
- (2) Considering \$9.8 million in upfront costs in the first 4 years prior to KWA operation, the cost of KWA exceeds the cost of DWSD until year 8. Once KWA begins delivering water in year 5, annual operating costs are less than DWSD by 13%.
- (3) Cumulative savings by Year 8 are projected to be \$5 million, compared to \$24 million in the Original projection.



# Karegnondi Water Authority®

4610 Beecher Road Flint, Michigan 48532-2617  
Phone (810) 732-7870 Fax (810) 732-9773

June 10, 2013

DEO  
RESOURCE MANAGEMENT DIVISION

JUN 13 2013

LANSING DISTRICT

Mr. Steven Busch  
District Supervisor  
Department of Environmental Quality  
525 West Allegan Street  
Lansing, MI 48909

Dear Mr. Steven Busch:

As the Karegnondi Pipeline project moves forward, I am excited to announce that we will be having an official groundbreaking for the project on June 28<sup>th</sup>. This represents a historic milestone, not only for the region, but for the entire state.

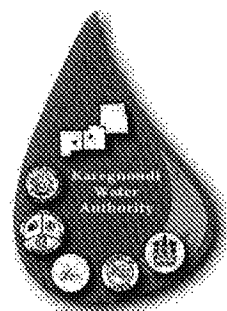
We will be holding the ceremony at the site where the intake will be built, near Port Huron. Details of the event are attached. While most people will drive themselves to enjoy the scenic view, we will be providing a bus to and from Genesee County with a LIMITED number of seats available. If you would like a spot on the bus you **MUST pre-register with my office prior to June 17<sup>th</sup>**. Seats will be first come first serve. Please call 810-701-6514 to pre-register. Please also note that this is a construction site, so casual dress should be used.

I realize this project has been decades in the making, and there are many individuals who have sacrificed much of their time to ensure that this day arrived. I truly hope that you are able to attend so that we may thank you and others for all of their hard work in seeing that the pipeline reached fruition.

The KWA is a game changer for our residents, and Michigan's economy overall. These days unfortunately come along much too infrequently. I hope to see you there so that we may celebrate our success together.

Regards,

Jeff Wright  
CEO - Karegnondi Water Authority



# Karegnondi Water Pipeline

## Ground Breaking Ceremony

Please join us as we begin construction of the Karegnondi Waterline, taking the next step in water independence for our region!

**Jeff Wright—Genesee County Drain Commissioner,** cordially invites you to this historic groundbreaking ceremony.

After the conclusion of the program—Snacks and refreshments will be served.

Due to the distance of the construction site and limited parking, a bus will be provided leaving the Genesee County area at 8:00 a.m. **\*\*Deadline to RSVP for bus is June 17th.**

*(Seats will be first come first serve through pre-registration. You will receive further details at that point.)* - **Bus is scheduled to return at 3:00 p.m.**

**June 28th**

**10:00 a.m.**

**3900 Fisher Rd.  
Lexington, MI**

(see attached map)

- Please RSVP for **BOTH** attendance and transportation prior to **June 17th.**

Please RSVP to Kevin Sylvester at  
810-701-6514  
[ksylvester@gcdcwws.com](mailto:ksylvester@gcdcwws.com)



For Questions Please Contact:

Kevin Sylvester  
Communications Director  
Genesee County Drain Commissioner's Office  
810-701-6514  
[ksylvester@gcdcwws.com](mailto:ksylvester@gcdcwws.com)



**A G E N D A:**  
**Flint River Transition/DWSD Shutoff**  
**Friday, April 25, 2014**

**Howard Croft, DPW Director:**

- Welcoming remarks, thank you to those in attendance.
- Recognize Elected Officials in attendance.
- Briefly describe recent work to finalize the preparations made to the plant.
- Provide quick facts about plant's capabilities and what they mean for Flint.

**Darnell Earley, Emergency Manager:**

- I want to highlight and recognize all the hard work done over the last two years that has led to this historic event, including the work of my predecessors Mike Brown and Ed Kurtz.
- I would also like to thank all of our staff, the Mayor, the City Council, Genesee County Drain Commissioner and his office, the MDEQ and Raffetis Financial Consultants for all their work in helping to identify KWA and the Flint River as the best choices for Flint's water needs. Their work is proof that this is the empirically correct course of action.
- The improvements that have been made to the plant over the past few years are in alignment with the City of Flint's strategic objectives, including the Master Plan and the Capitol Improvement Plan, which are steps toward ensuring a self-sustaining and financially healthy water and sewer system for Flint now and into the future.
- Having the resources of the river, the plant and eventually the KWA pipeline will position Flint to take advantage of increased economic growth and help to secure regional stability.

**Mayor Dayne Walling:**

- This is an historic moment for the City of Flint and I'm glad you could be here to witness it.
- Today we take a huge step forward in controlling the future of our most precious resource and utility by using the Flint River as our primary water source for the



**A G E N D A:**  
**Flint River Transition/DWSD Shutoff**  
**Friday, April 25, 2014**



first time in 50 years. This step will also allow Flint to have a permanent backup water source once the KWA pipeline comes online.

- The flipping of the switch we are here to witness today represents the true beginning of Flint's water independence.
- The Flint River was the first major asset to our community, so it is fitting that we return to its use for our city's benefit.
- Our water is safe, clean and tastes great; so come join me in a toast to Flint's future with water drawn and treated right here on this spot.

**Toast with Treated Flint River water, followed by media Q & A period  
(approx. 15 min.)**

DRAFT

# MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

## FLINT DRINKING WATER EVENTS TIMELINE

| Date                            | Event                                                                                                                                                       | Attachment |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Pre-1967                        | Flint Water Treatment Plant in operation using Flint River for drinking water                                                                               | 1          |
| Post-1967                       | Flint switched to Detroit Water and Sewerage Department for drinking water                                                                                  | None       |
| January 2006                    | Discussions regarding Karegnondi Water Authority, <i>Preliminary Long-Term Water Supply for Genesee County</i>                                              | 2          |
| June 25, 2009<br>September 2009 | <i>Lake Huron Water Supply Study Karegnondi Water Authority Executive Summary and Preliminary Engineering Report</i>                                        | 3          |
| March 2013                      | <i>Analysis of the Flint River as a Permanent Water Supply for the City of Flint</i> ; Prepared for: City of Flint dated July 2011                          | 4          |
| April 2013                      | Flint notifies Detroit Water and Sewerage Department of contract discontinuation and joins the Karegnondi Water Authority                                   | 5          |
| April 2013                      | Detroit Water and Sewerage Department sets termination of Flint water service contract to April 17, 2014                                                    | 6          |
| June 2013                       | Flint notifies the Department of Environmental Quality of intent to operate Flint Water Treatment Plant full time using Flint River for drinking water      | 7          |
| April 2014                      | The Michigan Department of Environmental Quality issues Flint Water Treatment Plant construction permits for full time operation enhancements               | 9          |
| May 2014                        | Flint stops purchasing Detroit Water and Sewerage Department water. Starts using the City of Flint Water Treatment Plant and Flint River for drinking water | 10         |
| August 2014                     | Flint <i>E. coli</i> bacteria violation, localized system Boil Water Advisory                                                                               | 11         |
| September 2014                  | Disinfection Byproducts compliance communication; the Michigan Department of Environmental Quality requests preemptive Operational Evaluation               | 12         |
| September 2014                  | Flint total coliform bacteria violation, localized system Boil Water Advisory                                                                               | 13         |

## MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY FLINT DRINKING WATER EVENTS TIMELINE

| Date                          | Event                                                                                                                                                                     | Attachment |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| October 2014                  | General Motors announces decision to stop using Flint River as source for production water                                                                                | 14         |
| December 16, 2014             | Disinfection Byproducts quarterly violation begins                                                                                                                        | 15         |
| December 31, 2014             | 1st 6-month round of lead and copper monitoring ends. Results due from Flint to Michigan Department of Environmental Quality on January 10, 2015                          | None       |
| January 21, 2015              | City of Flint Public Meeting regarding disinfection byproducts and bacteria                                                                                               | 17         |
| February 26, 2015             | E-mail from United States Environmental Protection Agency to Michigan Department of Environmental Quality regarding elevated lead sample                                  | 18         |
| February 27, 2015             | E-mail from United States Environmental Protection Agency to Michigan Department of Environmental Quality inquiring about Optimized Corrosion Control Treatment           | 19         |
| February 27, 2015             | Michigan Department of Environmental Quality response to United States Environmental Protection Agency email with statement regarding optimized corrosion control program | 20         |
| March 5, 2015                 | 2nd Disinfection Byproducts quarterly violation notice                                                                                                                    | 21         |
| March 30, 2015                | Michigan Department of Environmental Quality notifies Flint of Lead/Copper Monitoring Results.                                                                            | 16         |
| April 3, 2015                 | Long Term 2 Enhanced Surface Water Treatment Rule Letter                                                                                                                  | 22         |
| April 6, 2015                 | Flint proposes installation of Granular Activated Carbon Filter media to reduce disinfection byproducts                                                                   | 23         |
| April 23, 2015                | United States Environmental Protection Agency e-mail to Michigan Department of Environmental Quality regarding corrosion control treatment                                | 24         |
| April 24, 2015<br>May 1, 2015 | Michigan Department of Environmental Quality responds to United States Environmental Protection Agency regarding corrosion control treatment                              | 25         |

## MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY FLINT DRINKING WATER EVENTS TIMELINE

| Date           | Event                                                                                                                                                                                                                              | Attachment |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| April 27, 2015 | United States Environmental Protection Agency provided bottles to 212 Browning for lead/copper analyses                                                                                                                            | 26         |
| May 6, 2015    | Lead service line replaced at 212 Browning. United States Environmental Protection Agency on-site                                                                                                                                  | 27         |
| May 28, 2015   | Internal United States Environmental Protection Agency e-mail regarding results at 212 Browning                                                                                                                                    | 29         |
| June 9, 2015   | 3rd Disinfection Byproducts quarterly violation notice                                                                                                                                                                             | 30         |
| June 10, 2015  | Semi-Annual Conference call with United States Environmental Protection Agency                                                                                                                                                     | 31         |
| June 30, 2015  | E-mail from United States Environmental Protection Agency scheduling conference call on July 21, 2015 regarding elevated lead result and concerns regarding corrosion control                                                      | 32         |
| June 30, 2015  | 2nd 6-month round of lead and copper monitoring ends. Results due from Flint to Michigan Department of Environmental Quality on July 10, 2015                                                                                      | None       |
| July 9, 2015   | Michigan Department of Environmental Quality informed that United States Environmental Protection Agency draft internal memo is on ACLU website                                                                                    | 33         |
| July 14, 2015  | Michigan Department of Environmental Quality issues construction permit to Flint for Granular Activated Carbon filter media W151055                                                                                                | 34         |
| July 21, 2015  | Conference call with United States Environmental Protection Agency (Lead and Copper Rule implementation and Flint) during which it informs Michigan Department of Environmental Quality its interpretation of Lead and Copper Rule | 35         |
| July 24, 2015  | Michigan Department of Environmental Quality e-mail and draft letter 90th percentile lead determination = 11 parts per billion and City of Flint requirement to add corrosion control treatment                                    | 36         |

## MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY FLINT DRINKING WATER EVENTS TIMELINE

| Date               | Event                                                                                                                                                                                                                                                   | Attachment |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| July 28, 2015      | Michigan Department of Environmental Quality received blood lead level information from Michigan Department of Health and Human Services indicating that results since the switch to the Flint River are consistent with past years seasonal variations | 37         |
| August 4, 2015     | Meeting with city representatives at Governor's office                                                                                                                                                                                                  | 38         |
| August 17, 2015    | Michigan Department of Environmental Quality notifies Flint of lead/copper monitoring results and requires City to install corrosion control treatment                                                                                                  | 39         |
| August 23, 2015    | Michigan Department of Environmental Quality notified by an external party that a water quality study was about to begin in Flint                                                                                                                       | 40         |
| September 2, 2015  | Disinfection Byproducts return to compliance                                                                                                                                                                                                            | 43         |
| September 11, 2015 | United States Environmental Protection Agency e-mail confirming that Michigan Department of Environmental Quality was never sent the draft June 24, 2015 memo                                                                                           | 44         |
| September 21, 2015 | Meeting with Congressional representatives, legislators, United States Environmental Protection Agency and Michigan Department of Environmental Quality to discuss issues with water quality in Flint                                                   | 45         |
| September 22, 2015 | Meeting/Conference call with Michigan Department of Health and Human Services, Genesee County Health Department, and Michigan Department of Environmental Quality to discuss lead education/outreach                                                    | 46         |
| September 24, 2015 | Hurley Children's Hospital data reveals elevated blood lead levels in Flint children                                                                                                                                                                    | 47         |
| September 24, 2015 | Michigan Department of Health and Human Services response affirms State blood lead level data is more comprehensive than Hurley Hospital data                                                                                                           | None       |

## MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY FLINT DRINKING WATER EVENTS TIMELINE

| Date               | Event                                                                                                                                                                        | Attachment                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| September 25, 2015 | Flint issues Lead Advisory regarding drinking water                                                                                                                          | 48                                                    |
| October 1, 2015    | State Chief Medical Officer confirms Hurley blood lead level data                                                                                                            | None                                                  |
| October 1, 2015    | Genesee County Health Department issues "Do Not Drink" Advisory                                                                                                              | 49                                                    |
| October 2, 2015    | Michigan Department of Environmental Quality and Michigan Department of Health and Human Services press conference. Governor's Flint Action Plan announced.                  | 50                                                    |
| October 2, 2015    | Genesee County Health Department school screening water samples collected for lead analysis                                                                                  | 51                                                    |
| October 8, 2015    | Governor Press Conference: Flint to reconnect to Great Lakes Water Authority/Detroit Water and Sewerage Department                                                           | 52                                                    |
| October 15, 2015   | State Legislature authorizes a \$9 million to assist the City of Flint to pay for the return to the Detroit water system and to fund staff at schools to gauge lead exposure | None                                                  |
| October 16, 2015   | First weekly coordination meeting held between the City of Flint and state agencies                                                                                          | None                                                  |
| October 16, 2015   | Michigan Department of Environmental Quality meets with Flint Schools Superintendent and Genesee County Health Department                                                    | None                                                  |
| October 16, 2015   | Flint switches back to Detroit Water and Sewerage Department for water                                                                                                       | 53                                                    |
| October 21, 2015   | Governor Snyder announces formation of Flint Water Task Force to complete an After Action Review                                                                             | None                                                  |
| October 28, 2015   | Michigan Department of Environmental Quality issues construction permit for additional corrosion control treatment                                                           | 54<br><i>permit for corrosion control to DWSD HQ.</i> |
| October 30, 2015   | Michigan Department of Environmental Quality letter to Flint regarding corrosion control treatment operation                                                                 | 55                                                    |

## MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY FLINT DRINKING WATER EVENTS TIMELINE

| Date             | Event                                                                                                                                                                           | Attachment |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| November 3, 2015 | United States Environmental Protection Agency Memorandum regarding "Lead and Copper Rule Requirements for Optimal Corrosion Control Treatment for Large Drinking Water Systems" | 56         |
| November 4, 2015 | United States Environmental Protection Agency Memorandum regarding "Transmittal of Final Report – High Lead at Three Residences in Flint, Michigan"                             | 57         |
| Mid-Late 2016    | Planned connection to Karegnondi Water Authority (Lake Huron water to Flint Water Treatment Plant)                                                                              | None       |

Dec 9, 2015 added phosphate



# **HYDRAULIC ANALYSIS—TASK A2**

## **Transmission Main & Pump Station Transient Analysis (Surge Analysis)**

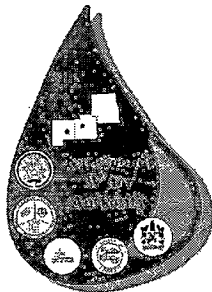
**FOR**

### **KWA WATER SUPPLY SYSTEM**

**February 6, 2014**

**AECOM / WADE TRIM**

**Flint, Michigan**



G-4160 Beecher Road

Flint, MI 48532

**Program Management by:**

 **WADE TRIM**

**AECOM**

**TECHNICAL REPORT**  
**KWA Water Supply System**  
**Transmission Main & Pump Station Transient Analysis**  
**(Surge Analysis)**

## **1.0 INTRODUCTION**

### **1.1 Objective**

The purpose of this Technical Report is to present the findings of the transient analysis on the raw water transmission main from the Lake Huron Pump Station (LHPS) along the shores of Lake Huron to the future Genesee County Water Treatment Plant (WTP) at Stanley and Marathon Roads. The analysis focused on the sudden tripping, or failure, of the pumps at both the LHPS and the Intermediate Pump Station (IPS) as well as providing the layout and sizing of air/vacuum valves along the transmission main alignment.

This Technical Report is in support of the KWA Water Supply System project.

### **1.2 Adverse Hydraulic Transient Conditions**

Pressure transients, also often referred to as surge or water hammer, can occur whenever flow conditions change within a water transmission system. Examples of such conditions include sudden closure of a valve or loss of power to pumps. For the vast majority of these transients, the impacts are not significant and specific control facilities are not necessary for protection. However, in some cases pressure transients can occur that result in significant damage to pipes and appurtenances.

The most critical condition associated with pump stations is often a total power failure during peak flows. This is the situation that has been analyzed for the transmission pipeline and pump stations that make up the large diameter steel pipeline portion of the Lake Huron Water Initiative project. When a pump suddenly loses power the resulting rapid spin down can result in extremely low pressures, which can collapse pipes and/or result in the formation of a vapor cavity. Vapor cavities will occur anywhere along the pipeline when negative pressures within the pipeline are lower than the vapor pressure of water. On sudden pump failure, the momentary continued forward movement of the water in the pipeline downstream of the pump's impeller creates a drop in pressure. This condition persists until the forward moving column of water slows and reverses. This drop in pressure is a function of the diameter and flow rate within the pipeline downstream of the pump. Extreme conditions can occur where this negative pressure can be large enough to create a vapor cavity. This situation can be quite damaging because the resulting cavitation may result in loss of pipe material and very high pressures can occur when the vapor cavity collapses upon a returning high pressure wave.

Along with these high pressures associated with the collapse of a vapor cavity, high pressures can also be realized at the pump station as the water reverses direction due to reflections in the transmission system such as, dead-ends, closed valves, and local storage tanks or reservoirs. These high pressures can burst pipes if the pressures exceed the rated pressure of the pipe material. The maximum pressures resulting from a transient analysis must be checked against the pressure ratings of the pipe, valves and other various appurtenances. Finally, attention must be paid to pump shut-downs and start-ups, both of which need to be performed in a controlled and slow manner. This is especially true if the pipeline has experienced conditions where areas of trapped air have created two separate water columns on either side of the air pocket. If the flow is increased too rapidly, then these two water columns will collide and can cause very large pressure spikes capable of rupturing pipelines.

## **2.0 TECHNICAL ANALYSIS**

### **2.1 Approach**

Software - H2OSurge version 10.0 (SP3, Update #4) was used to perform the transient evaluations presented in this Technical Report. H2OSurge was developed by Innovyze (formerly MWHSOft) to assist engineers in evaluating waterhammer for water distribution systems, pump stations and transmission mains. H2OSurge solves the basic equations of fluid mechanics for the transient flow of an incompressible fluid using the wave characteristic method. Technical documentation on H2OSurge can be found in its User Guide.

### **2.2 Assumptions**

#### **2.2.1 Layout and Profile**

The general layout of the system begins at the LHPS where a vertical turbine pump station is used to pump water from Lake Huron to a single 7-million gallon storage tank located at the IPS. Next, vertical turbine pumps at the IPS then pump water the remaining distance to the future Genesee County WTP reservoir. The total distance between the LHPS and the future Genesee County WTP is approximately 50 miles.

In support of this analysis, a single uniform pipeline stationing was provided in order to facilitate the communication of the results and recommendations. For quick reference, **Table 1** lists some of the key facilities and their associated stationing.

**Table 1: Pipeline Stationing for Key Facilities**

| Location                                  | Sta. (ft) |
|-------------------------------------------|-----------|
| <i>LHPS Pump No. 5 Discharge Flange</i>   | 0+0       |
| <i>Outside Wall Exiting the LHPS</i>      | 0+95      |
| <i>Location of PSV at the IPS</i>         | 1312+53   |
| <i>Storage Tank at the IPS</i>            | 1313+83   |
| <i>Outside Wall Entering the IPS</i>      | 1314+36   |
| <i>IPS Pump No. 3 Discharge Flange</i>    | 1314+91   |
| <i>Outside Wall Exiting the IPS</i>       | 1315+36   |
| <i>Location of PSV at WTP<sup>1</sup></i> | 2661+95   |
| <i>WTP Receiving Reservoir</i>            | 2675+95   |

The general layout of the pump stations and pipeline routing within the H2OSurge model is based upon the 30% design drawings; however, the specific pump sizing and selection is based upon design changes that occurred in November 2013.

### 2.2.2 Roughness

The transmission main will mainly consist of steel pipe from the American SpiralWeld Pipe Company, LLC. 66-inch diameter nominal pipe will be used between the LHPS and the IPS and 60-inch diameter nominal pipe will be used between the IPS and the Genesee County WTP.

While the roughness of the transmission main will change over time, with age resulting in potentially greater roughness, from a transient analysis perspective it is the smooth pipes that create the greatest potential for adverse, or elevated, surge pressures. Increased roughness serves to dampen the system and mitigate surge; however, increased flows due to future demand also impact surge. Higher flows result in larger surge effects.

<sup>1</sup> Assumed location for purposes of the H2OSurge model. Coincides with the location of a gate valve.

The hydraulic study<sup>2</sup> conducted for the LHPS during the 30% design considered the following C-values (roughness) associated in the flow shown in Table 2 below. Note this is the future maximum flow designed for in the 66-inch pipeline – namely the portion of pipeline between the LHPS and the IPS. Based upon an inspection of Table 2, this transient analysis used a C-value of 120 to approximate the future maximum design flow condition for both the 60- and 66-inch diameter pipeline.

**Table 2: LHPS C-Values**

| Design Demand Condition       | Flow (MGD) | C-value |
|-------------------------------|------------|---------|
| Future<br>(Modeled Condition) | 85         | 120     |

#### 2.2.3 Boundary Conditions and Tank/Reservoir

The furthest downstream element within the H2OSurge model is a node representing the wet-well at the LHPS as a fixed elevation reservoir. EL 654.0 (LWL) was used as the fixed water surface elevation. The storage tank at the IPS is modeled as a cylindrical tank with a ground elevation of EL 806.0 and a maximum level of 25-feet. This IPS storage tank essentially serves as a break within the system as pressure waves generated by the LHPS will reflect off of this fixed elevation. The surge condition with bypass operating at the IPS was not assessed since the bypass flow (estimated at approximately 20 mgd) would be much lower than the critical condition that was evaluated (85 mgd) and the potential for surge threatening the pipeline would be remote. At the upstream most end of the system, the future Genesee County WTP open ground reservoir will also serve as a similar reflection or terminus point. This upstream boundary was modeled as an cylindrical tank with a floor elevation of 800 feet and a maximum water level of 30 feet, which was used to coincide with a ground level of EL 830.0.

#### 2.2.4 Pressure Sustaining Valves

The system has two pressure sustaining valves (PSV). The first is located at sta. 1312+53 just before flows enter the storage tank at the IPS. As discussed in the 30% Project Design Report (Contract S.4004), the purpose of this valve is to prevent draining of the last 5 miles of pipeline between the LHPS and the IPS, as this portion of the pipeline has a downward trending gradient. This PSV will be set to maintain a minimum hydraulic grade line of 648 feet, or 38 feet of head above the valve.

<sup>2</sup> Taken from Sheet P-1.3 titled "Lake Huron Water Supply Initiative, Lake Huron Pump Station S-4001, Hydraulic Profile" dated 9/17/13.

While this valve is in the H2OSurge model, it is in the full open position during the future maximum flows of 85 MGD – as no sustained pressure is required at this HGL profile. Also, for the purposes of a transient creating device, it is assumed that this valve will be actuated over an averaging time period in order to prevent hunting by the valve. This means that the valve takes a number of readings (i.e., pressure) before deciding to move to a new set position. Because of this, it is assumed that it will not seek a new position over the period of a pressure wave moving through the system. However, even if it did close, it would do so in a gradual manner and simply close yielding a fixed reflection point nearly identical to that of the storage tank at maximum water level. This is a situation to be considered in the instrumentation and control of the pump stations.

The second PSV has not yet been designed, but it is understood that it will be located just upstream of the WTP and will serve a similar function as the PSV located at the IPS. For the purposes of this model, the PSV at the WTP is assumed to be located at sta. 2661+95 (Table 1) and set to maintain a minimum hydraulic grade line of EL 1013 feet at the highest point in the pipeline between the IPS and WTP, which is sta. 1972+93 with an pipeline invert of EL 950.39 feet. It was assumed that at this point a minimum pressure of approximately 30 psig would be desired to prevent siphoning. This is similar to how the PSV is operating on the pipeline between the LHPS and the IPS. However, it should be noted that based upon the calculations made during this transient study related to the PSV located at the WTP, it appears that the PSV will operate in a manner as to throttle flow (creating a backpressure) even during peak flows in order to maintain 30 psig at sta. 1972+93. Sta. 1972+93 is significantly higher (EL 950.39), than the WTP reservoir level of EL 830.00.

#### 2.2.5 Sonic Velocities

The magnitude of the transients is dependent on the speed at which the pressure waves propagate in the system. In turn, the speed of these pressure waves is dependent on the diameter, material type, and backfill conditions of the pipeline. For this analysis, a uniform wave speed of 2,872 fps was used throughout the entire system. This was selected as the highest calculated wave speed over the condition shown in Table 3 below. Small variations in wave speed (on the order of 10 to 15 percent) normally do not have a major impact on transient results.

The wave speed analysis used a water bulk modulus of 0.046 lb/ft<sup>2</sup> and a mass density of 1.936 slugs/ft<sup>3</sup>. For the pipe material, a Young's modulus of 4.282 lb/ft<sup>2</sup> and a Poisson's ration of 0.280 for steel were used.

**Table 3: Sonic Velocities**

| Pipe Class <sup>2</sup> | 66-inch Pipe             |                  | 60-inch Pipe             |                  |
|-------------------------|--------------------------|------------------|--------------------------|------------------|
|                         | Pipe Wall Thickness (in) | Wave Speed (fps) | Pipe Wall Thickness (in) | Wave Speed (fps) |
|                         |                          |                  |                          |                  |

<sup>2</sup> Taken from American SpiralWeld Pipe Company, LLC supplied Steel Pipe Design Calculations noted as file 2013-11-25 KWA INFO\_60 and 66\_Design Scope VE Wall 10-28-2013 Rev E.

|     |       |      |       |      |
|-----|-------|------|-------|------|
| 150 | 0.294 | 2713 | 0.294 | 2802 |
| 200 | 0.317 | 2783 | 0.294 | 2802 |
| 250 | 0.348 | 2870 | 0.317 | 2872 |

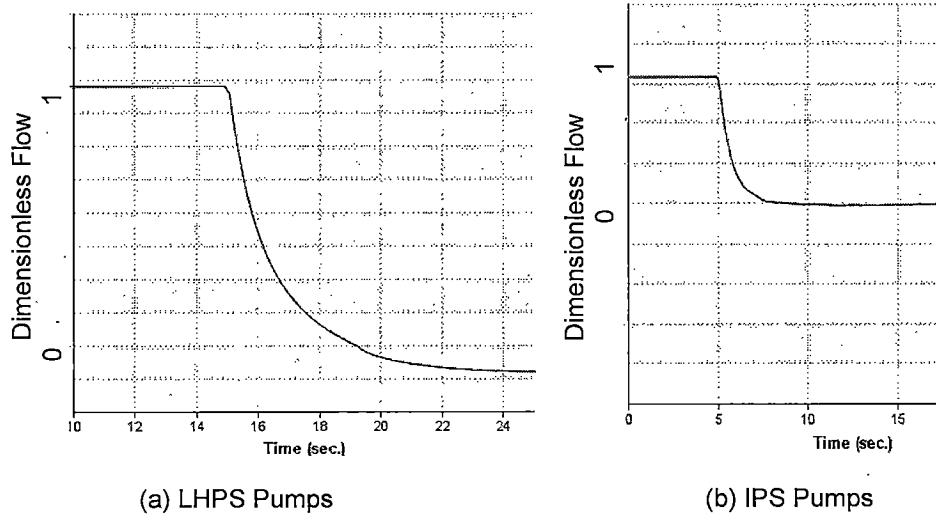
#### 2.2.6 Pump Characteristics

For the purposes of this analysis, the future conditions were evaluated for sudden pump failure. Table 4 summarizes the pump characteristics used in the H2OSurge model and reflect the pump selections made in November, 2013 letters<sup>4</sup> from the Genesee County Drain Commissioner's Office – Division of Water & Waste Services. These characteristics were used to define pump spin down characteristics upon a sudden pump trip. Figure 1 shows the actual spin down of each pump within the H2OSurge model. The pumps at the LHPS spin down in approximately 7 seconds upon tripping whereas the pumps at the IPS spin down in approximately 2-3 seconds upon tripping. The pump curves (flow vs. head) for each pump are shown in Table 5 and were taken directly from the manufacturer's supplied data.

**Table 4: Pump Characteristics**

| Pump Characteristic                         | LHPS     | IPS      |
|---------------------------------------------|----------|----------|
| Manufacturer                                | Peerless | Peerless |
| Model No.                                   | 36HXB    | 26HH     |
| Stages                                      | 5        | 3        |
| Rated Flow (US gpm)                         | 16,204   | 17,360   |
| Rated TDH (ft)                              | 475      | 205      |
| Rated Efficiency (%)                        | 81.5     | 87.8     |
| Pump Power (HP)                             | 2,384    | 1,024    |
| Combined Pump Inertia (lb-ft <sup>2</sup> ) | 9,337    | 1,758    |
| Pump Specific Speed                         | 1,107    | 2,870    |

<sup>4</sup> Letters from Mathew T Raysin (Division Engineer) to HRC and JH regarding "Lake Huron Initiative S.4001 and S.4004 Pump Selection Recommendation" both dated Nov. 13, 2013.



**Figure 1: Pump Spin-Down Plots**

**Table 5: Pump Curves**

| LHPS             |           | IPS              |           |
|------------------|-----------|------------------|-----------|
| Flow<br>(US gpm) | Head (ft) | Flow<br>(US gpm) | Head (ft) |
| 0.0              | 692.1     | 0.0              | 448.5     |
| 3136.8           | 671.8     | 2470.9           | 399.9     |
| 6273.5           | 629.2     | 4941.8           | 360.9     |
| 9410.3           | 577.6     | 7412.7           | 315.6     |
| 12547.1          | 531.1     | 9883.6           | 285.9     |
| 15683.8          | 492.9     | 12354.4          | 273.5     |
| 18820.6          | 454.1     | 14825.3          | 255.9     |
| 21957.4          | 399.0     | 17296.2          | 211.6     |
| 25094.1          | 314.1     | 19767.1          | 149.6     |



### 2.2.7 Check and Cone Valves

Initially, the transient analysis assumed that each pump would be protected by a single fast closing swing type check valve. This type of valve is typically used in applications where the reverse flow of water needs to be avoided. The pump check valve closure time was assumed to be 0.1 seconds—in effect, an instantaneous closure. It was also considered to be a reopening check valve—allowing flow reversal. Therefore, using a reopening check valve provides a conservative estimate of a worst case condition concerning check valves as typical surge mitigation designs apply the use of a soft close and non-reopening check valve. Such valves do not slam shut, causing secondary high pressure spikes.

The 60% design drawings of the pump stations indicate that cone valves will be used downstream of each pump. For each pump, a cone valve will slowly open after the pump is started and slowly close before the pump is shut off. However, during a pump trip some attention needs to be given to how the cone valve will close to insure neither slamming of the valve nor flow reversal of the pump, which can be problematic for the pump and also overwhelm the wet-well with backflow. Pratt's standards state that normal open/close can be set from 60 to 300 seconds and emergency close set from 10 to 20 seconds.

## 3.0 NO SURGE PROTECTION RESULTS

A severe transient condition associated with pump stations is the sudden failure, or tripping, of the pumps. When the power to the motor is suddenly cut off, the pump will rapidly spin down, creating a negative pressure wave that travels upstream. Results indicate vapor pressures are possible throughout much of the pipeline's profile (**Figure 3**). Such conditions can result in the formation of vapor cavities throughout the pipeline, but a vapor cavity will most certainly occur at the downstream side of the pumps given the large mass of water moving away from this point with no supply water filling the cavity. Once the outgoing negative pressure reflects off the tank/PSV at the IPS, or the reservoir/PSV at the Genesee County WTP, a positive pressure wave reflects back. This positive pressure wave will cause a sudden collapse of the vapor cavity.

Results indicate that there are essentially two areas of concern with pump trips: (1) the formation and collapse of a vapor cavity immediately downstream of the pumps and (2) the potential for water column separation along the pipeline resulting from vapor cavities or trapped air.

The first area of concern, the formation of a vapor cavity downstream of the pumps upon tripping, is captured by the H2OSurge simulation shown in **Figure 2** and **Figure 3**. Downstream of each pump station, LHPS and IPS respectively, pressure spikes of 508 and 268 psig are noted. Using the supplied steel pipe design calculations provided by the American Spiralweld Pipe Company, LLC, listed surge rating pressures range from 338-400 psig meaning that for all listed pipe classes (150, 200 and 250) the calculated surge pressures are exceeding, or very close to exceeding, these limits. Also, consideration must be made for valves and other appurtenances, which may have pressure ratings less than that of the pipe material.

The second area of concern is where the system has trapped air collecting at a high point during periods of low use or during filling of the transmission main. During this situation, a high pressure spike (potentially 2-3 times the normal operating pressures) can result from the collision of the two water columns. This collision can be approximated by a sudden closure event. Using a line velocity of 5.54 ft/s (based on the 66-inch diameter pipeline between the LHPS and the IPS flowing at 85 MGD), a sudden closure of a valve would result in a 214 psig increase in pressure above the current operating pressure of the pipeline. Two or three times 214 psig would be 428-642 psig above operating pressure. If such pressures occurred, then the pipeline would likely rupture given that these pressures exceed the limits listed for all classes of pipe.

Therefore, based upon this assessment of an unprotected system, it is determined that surge mitigation and protection is required both at the pump stations to protect the pumps and also along the pipeline itself.

Note: The analysis focused on the worst case conditions regarding the PSVs in the system. For the PSV located at the IPS this condition was the assumption that it was not operating correctly and left in a full open position. However, the PSV at the WTP was assumed to be functioning.

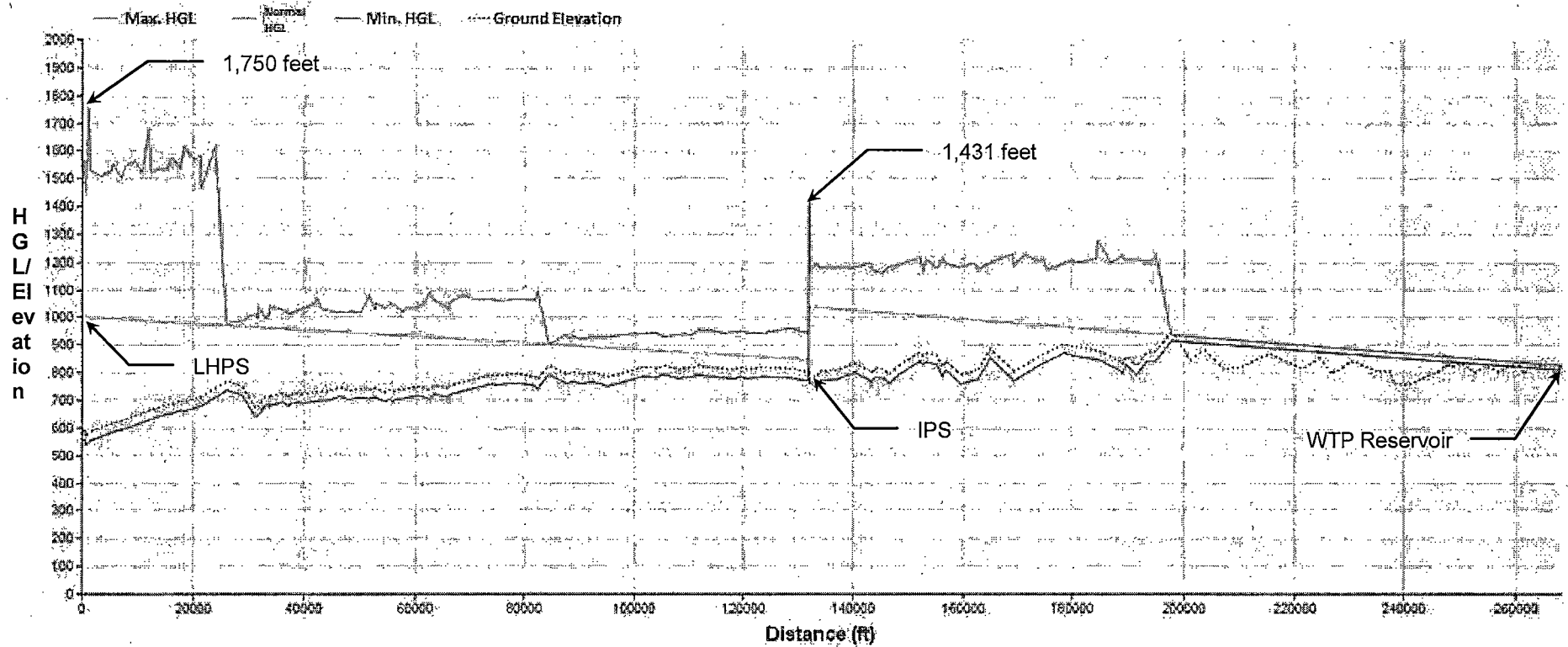


Figure 2: Transient Head Profile Envelope (Pump Trip) – No Surge Protection; PSV at WTP Full Open (Out-of-Service)

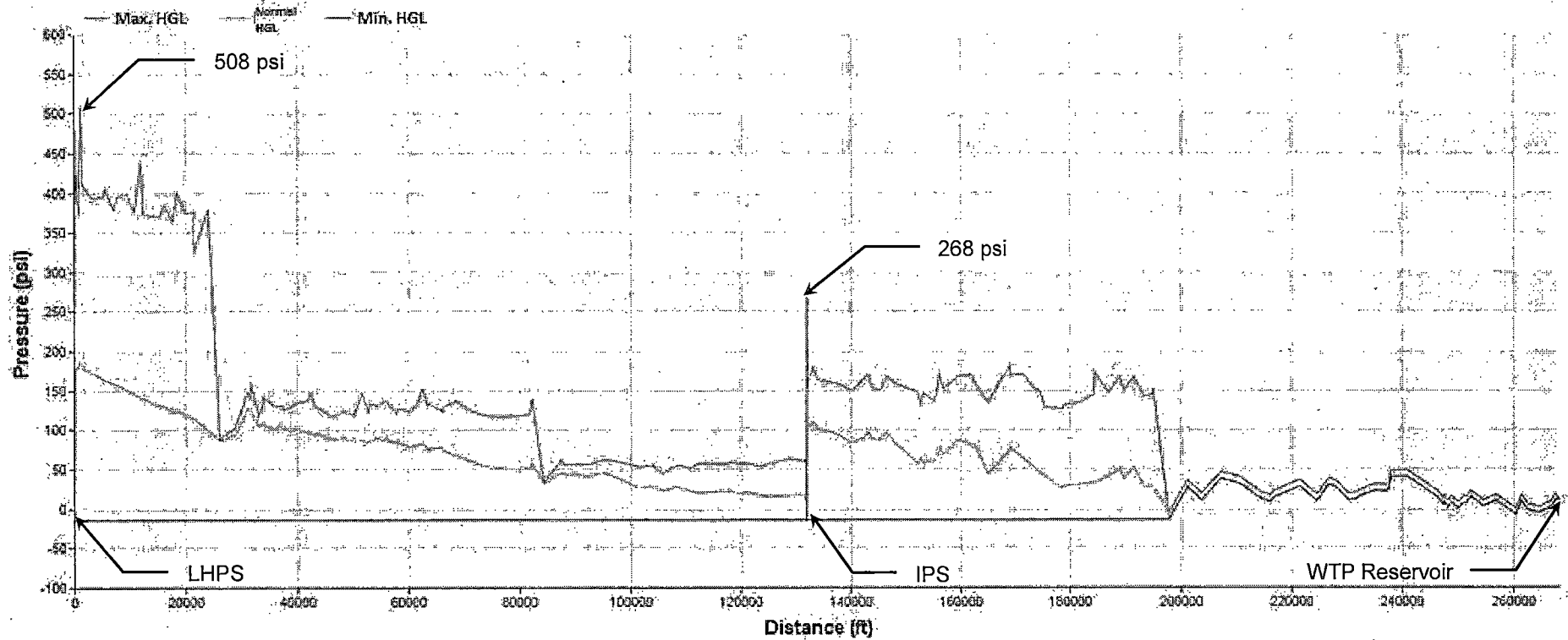


Figure 3: Transient Pressure Profile Envelope (Pump Trip) – No Surge Protection; PSV at WTP Full Open (Out-of-Service)

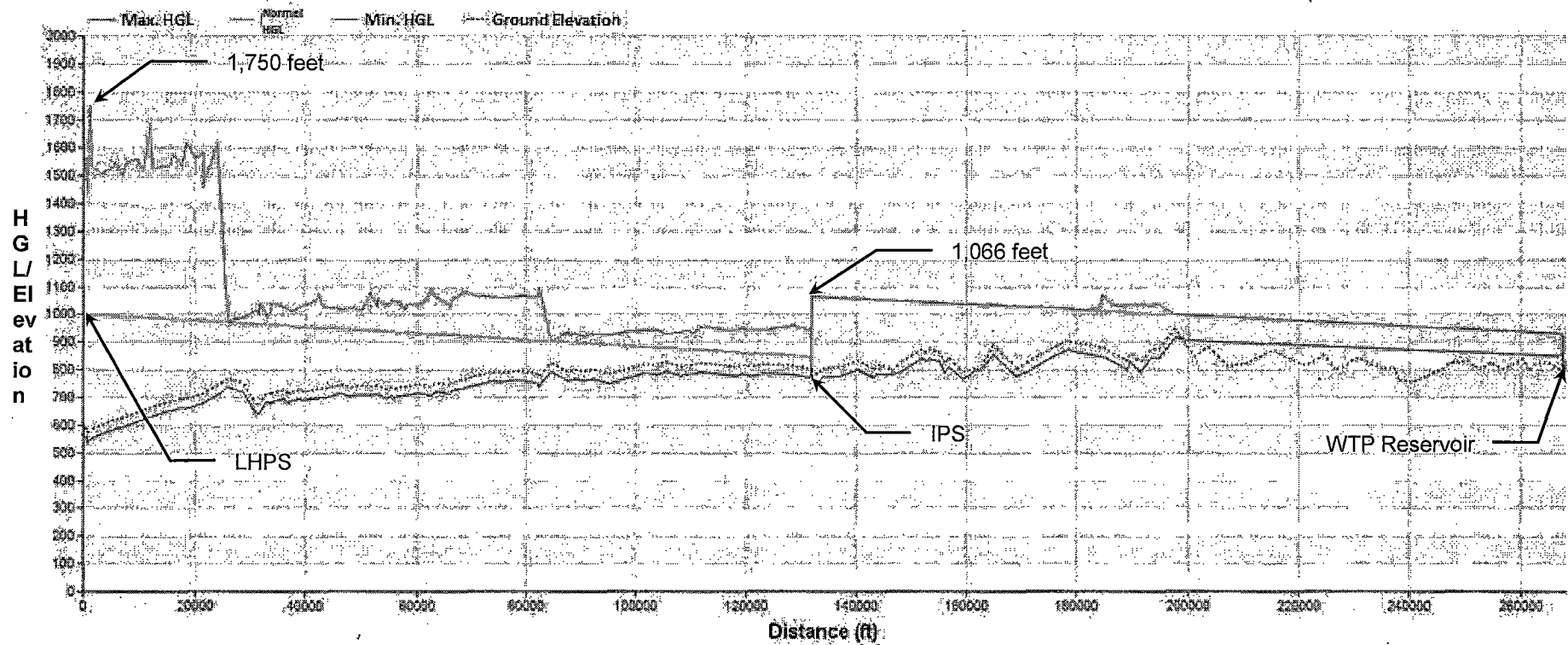


Figure 4: Transient Head Profile Envelope (Pump Trip) – No Surge Protection; PSV at WTP (In-Service)

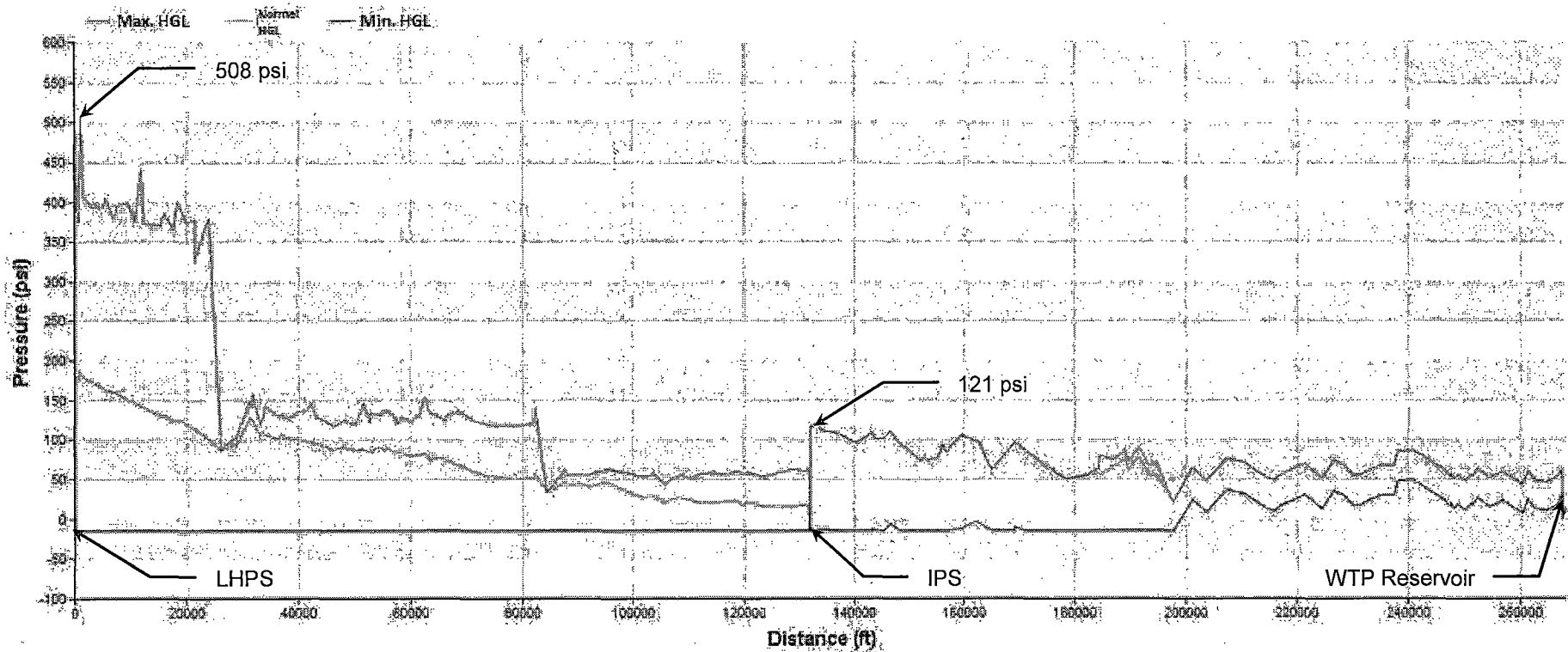


Figure 5: Transient Pressure Profile Envelope (Pump Trip) – No Surge Protection; PSV at WTP (In-Service)

## 4.0 SURGE MITIGATION

### 4.1 Types of Control

There is a variety of transient control equipment that can be used to limit pressure transients to an acceptable range; each has an associated advantage and disadvantage. The following is a list of equipment considered for this project.

#### 4.1.1 Combination Air/Vacuum Release Valves

These valves are located at points where column separation is anticipated. They are also generally applied along the pipeline at regular intervals of 1,500 to 2,400 feet to insure adequate removal of any trapped or dissolved air. The vacuum portion of the valve opens on negative pressure to permit air to enter the pipeline. The air entering the pipeline eliminates large negative pressures. Following the low-pressure transient, the air release portion of the valve needs to slowly expel the air in order to avoid creating another transient condition that can result in the slamming together of the two water columns.

These valves are relatively inexpensive and availability is good. An air/vacuum valve however can have several disadvantages. The valve does not begin to provide protection until the negative pressure occurs. Also, depending on the downstream profile of the pipe, the incoming air can quickly migrate into the system along the crown of the pipe and can cause column separation – a trapped pocket of air. Upon the returning high pressures, this pocket may vent too quickly through the vacuum relief valve resulting in very high pressures as the water column rejoins. Following the low-pressure transient, the air that enters the pipeline should be expelled slowly to avoid creating another transient condition. An adequate period of time should be allowed for the air to be expelled before the pumps are restarted.

A careful review of manufacturer's technical information should be made when selecting this type of valve for transient control. Several cases cited in literature describe the collapse of piping systems due to the failure of an air inlet valve that was poorly sized, designed, or maintained. The potential for operational failures in air valves should not be ignored. These valves also require regular maintenance and operation to insure that they are in good working order when called upon to protect the system from a transient. Poorly, or improperly, maintained air valves can result in localized transients called air slam. The air slam pressure when air is expelled from an air release/vacuum valve is based upon the size of pipe, size of valve and the pressure in the water main at the time of the air slam. **Table 6** lists the potential air slam pressures that could occur associated with poor, or improperly, maintained air/vacuum valves. The pressures listed in **Table 6** are pressure increases above the operating pressure within the pipeline at the air/vacuum valve in question.

Despite some of the disadvantages associated with air/vacuum valves, they remain an essential part of a surge mitigation and prevention strategy and are therefore required for this system.

**Table 6: Air Slam Pressures (psi)**

| Valve Size | 66-inch | 60-inch |
|------------|---------|---------|
| 6-inch     | 104     | 126     |
| 4-inch     | 46      | 56      |
| 2-inch     | 12      | 14      |

#### 4.1.2 Self Closing and Non-Reopening Valves

These types of valves replace standard flap-type check valves. They have a self-assisted closing mechanism that prevents slamming and once closed they remain so until the transient conditions pass. An example of such a valve is the Pratt type cone valve being specified for in this design.

#### 4.1.3 Surge Relief Valves

These valves are often placed just downstream of a pump check valve and are set to open at a set high pressure, thus relieving the potential high pressure spikes. The discharge from the surge valve is typically sent back to the pump station wet-well; however, it can be discharged to any location. Attention must be paid to the distance of discharge pipe, and associated fittings, when sizing the valve.

### 4.2 Recommended Surge Mitigation

An analysis of the system shows that surge mitigation and protection is needed for both pump stations and the pipeline itself. This analysis focused on providing the required surge mitigation and protection through air/vacuum valves and surge relief valves at both pump stations. Each is discussed below.

#### 4.2.1 Air/Vacuum Valves

The use of ARI air/vacuum (or owner approved equivalent) valves are recommended for air release management and surge protection. As part of this study, ARI USA was also contacted to review and provide input regarding the sizing and placement of ARI valves. It is important that the specific valve manufacture be consulted when selecting air/vacuum valves for a project such as this - namely long, large diameter transmission mains.

For this project, the following ARI valves are recommended:

- D-060-C HF (285 psi) – Combination air valve for high flow and has the features of both an air release valve and an air & vacuum valve. The air release component is designed to automatically release small pockets of air to the atmosphere as they accumulate along the pipeline when it is full and operating under pressure. The air & vacuum component is designed to automatically discharge or admit large volumes of air during the filling or draining of a pipeline. This valve will open to relieve negative pressures whenever water column separation occurs.
- D-062 HF (360 psi) – Same as above but rated for a higher working pressure.



- D-062 HF NS (360 psi) – This valve is a surge-dampening, slam-preventing, 3-stage combination air valve. At sudden drainage and/or water column separation, the air & vacuum orifice admits air at high flow rates, thus preventing vacuum. As the water column and/or pressure wave returns, large volumes of air are discharged at high velocities, raising the non-slam disc, partially closing the air & vacuum orifice and allowing air to exhaust slowly through the smaller orifice of the non-slam disc. This slowly exhausting air pocket dampens the slam of the returning water column, thus suppressing the pressure surge. As the water flow arrives at a much slower rate, dampened by the slower air discharge, it buoys up the main float, gently closing the air & vacuum component of the air valve.
- D-040 (250 psi) – Combination air valve. This is essentially similar to the D-060-C HF but it does not have the high flow capacity.

Table 7 below provides a summary of the quantity of each valve listed above and Appendix A provides a detailed listing of the location of each valve.

The air/vacuum layout presented in Appendix A is based upon standard practices for air/vacuum valve placement and is recommended given the expensive nature of a buried asset such as a large diameter transmission main that lacks redundancy. Should the pipe fail, the future WTP would be without water for a potentially extended period of time. The proposed layout of the air/vacuum valves have considered this and reflects a degree of conservatism aimed at providing redundancy to the pipeline system. In general, the valves were first placed at the most vital areas – namely high points. Next, they were placed where the slope changes drastically, which indicates areas most likely to have water column separation. Finally, as good standard practice, valves were placed on long gradual slopes. ARI recommends limiting air valve spacing to no more than 1,500-2,400 feet. This is because trapped air can only migrate so far. Generally, speaking all 2-inch diameter air/vacuum valves listed in Table 7 are for removal of trapped air.

It is recommended that air/vacuum valves should be located in an air/vacuum station that is insulated to protect the valves from freezing in the worst weather. The air/vacuum station needs to have air vents (in/out) sized to be equal or greater than diameter of the air valve. The floor of the station should be sloping to a sump to make cleanup possible. An aggressive maintenance program should be adopted to ensure that air/vacuum valves will be operational when needed.

Finally, this layout is based upon the 30% design drawings. The final placement of the valves should be reviewed during 90% design and particular attention should be given to the placement within the pump station layouts. Depending on the final header arrangements and pump positions, there may be more than one air/vacuum valve required within the pump stations.

**Table 7: Summary of Air/Vacuum Valve Quantities**

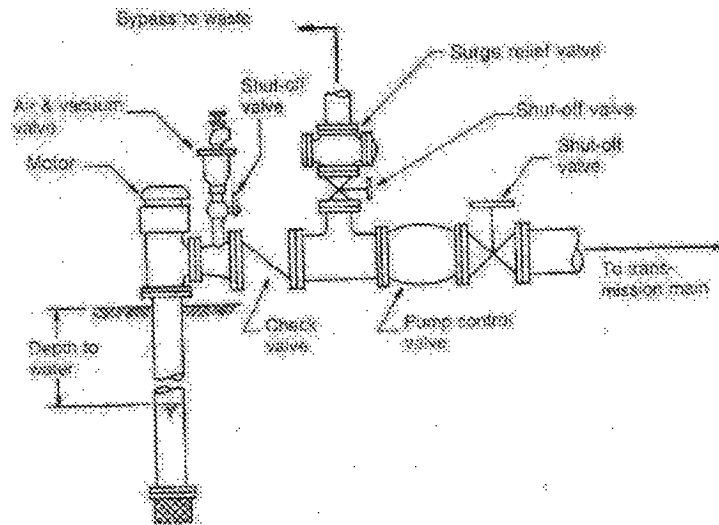
| Valve Model | Valve Size (Inches) | Quantity |
|-------------|---------------------|----------|
| D-060-C HF  | 3                   | 1        |
|             | 4                   | 7        |
|             | 6                   | 20       |
| D-062 HF    | 2                   | 20       |
|             | 4                   | 5        |
|             | 6                   | 25       |
| D-062 HF NS | 2                   | 7        |
|             | 6                   | 6        |
| D-040       | 2                   | 15       |

#### 4.2.2 Non-Reopening/Cushion-Closed Check Valves and a Surge Relief Valve at both the LHPS and IPS

In order to limit the surge pressures at the LHPS, two Golden Anderson (or owner approved equivalent) 20-inch diameter surge relief Figure 6700 (globe style) valves, with a class 250 rating (300 psig) should be installed – one on each 48-inch diameter header. In order to limit the surge pressures at the IPS a Golden Anderson (or owner approved equivalent) one 20-inch diameter surge relief Figure 6700 (globe style) valve with a class 250 rating (300 psig) should be installed.

As a general note, it is better to oversize a surge relief valve as the valve will simply throttle in a partially open position if less than its full capacity is required. However, undersizing a surge relief valve could adversely affect its ability to protect the system.

This valve is typically installed just downstream of the pump's check valves. The valve should be discharged to a location without restrictions; such as backpressure on the valve, long runs of pipe, etc. Modeling assumed no significant restrictions to the surge discharge. If such constraints are required, then a larger valve size would likely be required. **Figure 6** shows a typical arrangement of a pump protected by a surge valve.



**Figure 6: Typical General Arrangement of Surge and Check Valves**

Surge relief valves typically have two settings. The first is a desired relief setting above which the valve opens to relieve the pressure. This setting should be about 10 percent higher than the highest normal system pressure, but it can be field adjusted. The second setting is the closing speed. A slow closing is recommended to prevent secondary surges and valve chatter. While this setting can be field adjusted also, the H2OSurge model assumed a closing time of 30 seconds. The opening speed generally cannot be adjusted but is generally very fast, which is desirable.

#### 4.2.3 Controlled Pump Start-up and Shut-down

It is recommended that a means to control the start-up of the pumps at both the LHPS and IPS be provided. It is understood that the pumps selected will not be VFDs with the exception of Pump 1 at the LHPS. Instead a cone valve will be used as a pump control valve.

A pump-control valve cannot slam shut upon sudden pump failure. However, the valve must be equipped with a stored energy closure mechanism to ensure operation when power fails. This stored energy system is generally trickled-charged batteries for electric systems, a compressed air tank (with enough capacity to operate every valve through two cycles), or other appropriate method.

It is important that the maintenance staff understand the importance of gradual changes to these pumps. The initial filling of the transmission main, or subsequent filling after a power failure or shut down, must be done in a careful and controlled manner. Until all large pockets of air have been expelled, the pipeline velocities should be kept below 1 ft/s. Detailed start-up procedures should be developed and should be provided in an operation and maintenance (O&M) manual.

A general rule of thumb is to start-up or shut-down a large pump at a rate of 10 times the characteristic response time. For the 66-inch diameter pipeline between the LHPS and the IPS, the characteristic response time is 91.5 seconds yielding a start-up or shut-down rate of

over 15.3 minutes. For the 60-inch diameter pipeline between the IPS and the WTP the characteristic response time is 94.9 seconds yielding a start-up or shut-down rate of over 15.8 minutes.

Based upon this general rule-of-thumb and a review of the currently provided standards on closing and opening times from Pratt, **Table 8** was developed to provide some initial guidance on valve settings under various pump operational considerations. During final design, and prior to start-up, these values should be reviewed with Pratt and the design engineers.

**Table 8: Pratt Cone Valve Settings**

| Scenario                                                 | Valve Timing (sec.) |
|----------------------------------------------------------|---------------------|
| <i>Emergency Close (example, pump trip)</i>              | 20                  |
| <i>Pump Start-up During Filling or After a Pump Trip</i> | >950                |
| <i>Normal Start-up and Shutdown of a Single Pump</i>     | 300                 |

### 4.3 Surge Mitigation Model Results

Adopting the recommended surge mitigation and protection measures outlined above in Section 4.2 will result in a protected system with a limited built-in redundancy. The H2OSurge model was updated with the recommended surge mitigation measures, less all 2-inch diameter air/vacuum valves, to document the calculated reduction in pressures along the pipeline during pump trips at both the IPS and LHPS. These results are shown in **Figure 7** and **Figure 8**. The 2-inch diameter air/vacuum valves were not included because their main purpose is to provide a minimum level of air removal along the pipeline. Since H2OSurge simulations were not made assuming trapped air as initial conditions, the addition of these valves would show little difference from a maximum surge perspective.

The most notable difference between the surge mitigation results (**Figure 7** and **Figure 8**) and no surge protection results (**Figure 2** and **Figure 3**) is the significant reduction in maximum pipeline pressures downstream of both the LHPS and IPS to within the acceptable pipe class pressure ratings. This report will be utilized for a document on pipe class selection.

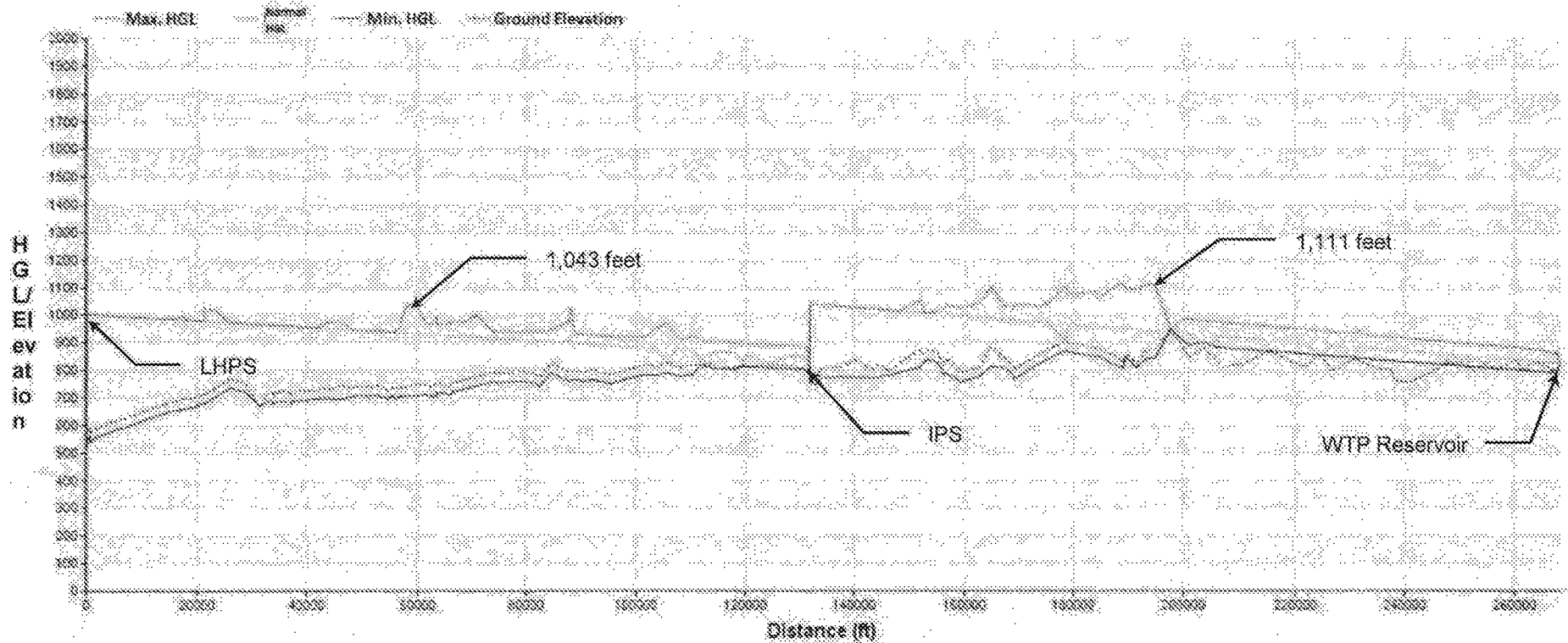


Figure 7: Transient Head Profile Envelope (Pump Trip) – Recommended Surge Protection; PSV at WTP (Out-of-Service)

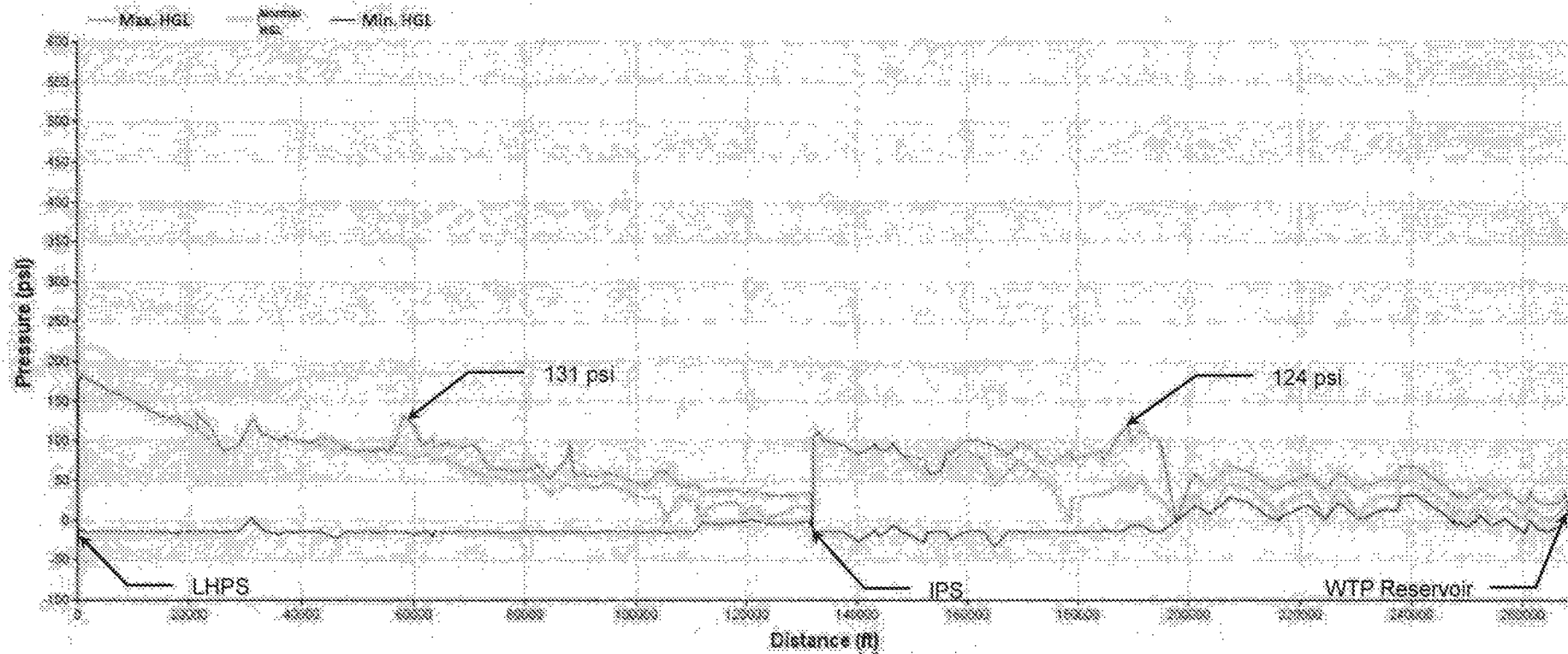


Figure 8: Transient Pressure Profile Envelope (Pump Trip) - Recommended Surge Protection; PSV at WTP (Out-of-Service)

# Appendix A

## Air/Vaccum Valve Sizing and Location Table

| ARI Valve Specifications |                       |                          |       |                          |                     |               |                    |                                                                                                                                                                            |
|--------------------------|-----------------------|--------------------------|-------|--------------------------|---------------------|---------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D-060-C HF<br>(285 PSI)  | D-062 HF<br>(360 PSI) | D-062 HF NS<br>(360 PSI) | D-040 | DP CONTRACT<br>STA. (FT) | TOTAL<br>STA. (FT.) | PIPE MATERIAL | PIPE DIA.<br>(IN.) | NOTES                                                                                                                                                                      |
| \$4001                   |                       |                          |       |                          |                     |               |                    |                                                                                                                                                                            |
|                          |                       | *(4)-2"; (4) 6"          |       |                          | +                   | -             | -                  | The 2" valves are located between the cone valve and the pump, with one on each pump discharge. The 6" valves are located on the combined header, with two on each header. |
|                          | 6"                    |                          |       |                          | 2+00                | welded steel  | 66                 | Just upstream of Birch Creek, Approximately station 2+00                                                                                                                   |
|                          | 4"                    |                          |       |                          | 4+55                | welded steel  | 66                 | Just downstream of Birch Creek                                                                                                                                             |
| \$4002                   |                       |                          |       |                          |                     |               |                    |                                                                                                                                                                            |
|                          |                       |                          |       | 20+71                    | 12+89               | welded steel  | 66                 | START OF LAKE HURON PUMP STATION CONTRACT S-4002                                                                                                                           |
|                          | 2"                    |                          |       | 38+94                    | 31+12               | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          | 2"    | 84+00                    | 76+18               | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          | 2"    | 126+20                   | 118+38              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 161+00                   | 153+18              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 183+00                   | 175+18              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          | 2"    | 207+00                   | 199+18              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          | 2"    | 246+75                   | 238+93              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| (2)-6"                   |                       |                          |       | 267+75                   | 259+93              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          | 2"    | 295+00                   | 287+18              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 337+50                   | 329+68              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 368+50                   | 360+68              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 4"                       |                       |                          |       | 397+90                   | 390+08              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          | 2"    | 423+00                   | 415+18              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 437+70                   | 429+88              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 469+75                   | 461+93              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 4"                       |                       |                          |       | 508+10                   | 500+28              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 4"                       |                       |                          |       | 534+65                   | 526+83              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 4"                       |                       |                          |       | 560+10                   | 552+28              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          | 2"    | 584+10                   | 576+28              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 608+00                   | 600+18              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
| 6"                       |                       |                          |       | 641+65                   | 633+83              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                                                                                          |
|                          |                       |                          |       | 642+00                   | 634+18              | welded steel  | 66                 | END CONTRACT S-4002/BEGIN CONTRACT S-4003 (sta 642+00)/START BRICKER ROAD CONTRACT S-4003 (sta 650+60)                                                                     |



| ARI Valve Specifications |                       |                          |       |                          |                     |               |                    |                                                                                                       |
|--------------------------|-----------------------|--------------------------|-------|--------------------------|---------------------|---------------|--------------------|-------------------------------------------------------------------------------------------------------|
| D-060-C HF<br>(285 PSI)  | D-062 HF<br>(360 PSI) | D-062 HF NS<br>(360 PSI) | D-040 | DP CONTRACT<br>STA. (FT) | TOTAL<br>STA. (FT.) | PIPE MATERIAL | PIPE DIA.<br>(IN.) | NOTES                                                                                                 |
| S-4003                   |                       |                          |       |                          |                     |               |                    |                                                                                                       |
|                          |                       |                          | 2"    | 677+69                   | 661+27              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 701+09                   | 684+67              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 725+66                   | 709+24              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| 6"                       |                       |                          |       | 752+57                   | 736+15              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| 6"                       |                       |                          |       | 801+80                   | 785+38              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 833+85                   | 817+43              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| (2) 6"                   |                       |                          |       | 859+50                   | 843+08              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| 4"                       |                       |                          |       | 904+00                   | 887+58              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| 4"                       |                       |                          |       | 938+75                   | 922+33              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 1090+10                  | 983+68              | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| 6"                       |                       |                          |       | 1032+50                  | 1016+08             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| (2) 6"                   |                       |                          |       | 1071+55                  | 1055+13             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 1105+75                  | 1089+33             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| 6"                       |                       |                          |       | 1133+25                  | 1116+83             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 1157+25                  | 1140+83             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 1181+25                  | 1164+83             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| 4"                       |                       |                          |       | 1209+65                  | 1193+28             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
| (2) 6"                   |                       |                          |       | 1250+20                  | 1233+78             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          | 2"    | 1301+50                  | 1285+08             | welded steel  | 66                 | AIR/VACCUUM VALVE                                                                                     |
|                          |                       |                          |       | 1328+35                  | 1311+93             | welded steel  | 66                 | END OF CONTRACT CONNECTION TO CONTRACT S-4004                                                         |
| S-4004                   |                       |                          |       |                          |                     |               |                    |                                                                                                       |
|                          | 4"                    |                          |       | 5+00                     | 1313+83             | welded steel  | 48                 | At high point of water main prior to pressrue sustaining valve. Near station 5+00                     |
|                          |                       | (4) 2"                   |       |                          |                     |               |                    | Required between Cone Valve and pump discharge (as shown already in 90% plans)                        |
|                          |                       | (2) 6"                   |       |                          | 1314+91             | welded steel  | 48                 | On the header imediately downstream of last pump discharge.                                           |
|                          | 4"                    |                          |       |                          | 1315+36             | welded steel  | 48                 | After Meter Chamber (will be a high point to get under wetlands - needs to be coordinated with S-4005 |

| ARI Valve Specifications |                       |                          |       |                           |                     |               |                    |                                                                                       |
|--------------------------|-----------------------|--------------------------|-------|---------------------------|---------------------|---------------|--------------------|---------------------------------------------------------------------------------------|
| D-060-C HF<br>(285 PSI)  | D-062 HF<br>(360 PSI) | D-062 HF NS<br>(360 PSI) | D-040 | DP CONTRACT<br>STA. (FT.) | TOTAL<br>STA. (FT.) | PIPE MATERIAL | PIPE DIA.<br>(IN.) | NOTES                                                                                 |
| S 4005                   |                       |                          |       |                           |                     |               |                    |                                                                                       |
|                          |                       |                          |       | 4+90                      | 1318+26             | welded steel  | 60                 | END CONTRACT S-4004 BEGIN CONTRACT S-4005                                             |
|                          | 2"                    |                          |       | 21+16                     | 1334+52             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 34+26                     | 1397+62             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 4"                    |                          |       | 120+69                    | 1434+05             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 163+47                    | 1476+83             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | (2) 6"                |                          |       | 203+00                    | 1516+36             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 213+84                    | 1527+20             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 234+15                    | 1547+51             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 250+08                    | 1563+44             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 301+09                    | 1614+45             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | (2) 6"                |                          |       | 331+20                    | 1644+56             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 355+20                    | 1668+56             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 396+41                    | 1709+77             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 427+33                    | 1740+69             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | (2) 6"                |                          |       | 467+73                    | 1781+09             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 497+72                    | 1811+08             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 527+00                    | 1840+36             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 551+00                    | 1864+36             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 573+75                    | 1892+11             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 616+28                    | 1929+64             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          |                       |                          |       | 631+64                    | 1945+00             | welded steel  | 60                 | END OF CONTRACT CONNECTION TO CONTRACT S-4006 / START KINGS MILL ROAD CONTRACT S-4006 |
| S 4006                   |                       |                          |       |                           |                     |               |                    |                                                                                       |
|                          | (2) 6"                |                          |       | 37+93                     | 1972+93             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 61+92                     | 1996+92             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 97+27                     | 2032+27             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 121+27                    | 2056+27             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 157+25                    | 2092+25             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 190+57                    | 2125+57             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | (2) 6"                |                          |       | 234+40                    | 2157+65             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 258+40                    | 2181+65             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 318+35                    | 2241+60             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 375+10                    | 2298+35             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 399+10                    | 2322+35             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 423+10                    | 2346+35             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 447+10                    | 2370+35             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 2"                    |                          |       | 501+23                    | 2424+48             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 525+32                    | 2471+55             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 596+00                    | 2497+85             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 4"                    |                          |       | 648+00                    | 2512+95             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 4"                    |                          |       | 676+70                    | 2541+65             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | 6"                    |                          |       | 734+97                    | 2599+92             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          | (2) 6"                |                          |       | 821+18                    | 2642+13             | welded steel  | 60                 | AIR/VACCUUM VALVE                                                                     |
|                          |                       |                          |       | 850+00                    | 2670+95             | welded steel  | 60                 | END OF CONTRACT CONNECTION TO CONTRACT S-5001                                         |
| S 5001                   |                       |                          |       |                           |                     |               |                    |                                                                                       |
|                          | 6"                    |                          |       |                           | 2675+95             | welded steel  | 60                 | 60" PIPE TO UNDERGROUND RESERVOIR                                                     |

## **Thelen, Mary Beth (DEQ)**

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**Subject:** RDS - REMARKS (AHeaton) Press Conference Re: Flint Water  
**Location:** Mott Foundation Conference Center, 503 S. Saginaw, Flint  
**Start:** Thu 10/8/2015 10:00 AM  
**End:** Thu 10/8/2015 10:35 AM  
**Show Time As:** Tentative  
**Recurrence:** (none)  
**Meeting Status:** Not yet responded  
**Organizer:** GovCalendar  
**Required Attendees:** Agen, Jarrod (GOV); Biehl, Laura (GOV); Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Hollins, Harvey (GOV); Clayton, Stacie (GOV); Lyon, Nick (DHHS); Grijalva, Nancy (DHHS)

Purpose: Press conference regarding Flint water

**Program Participants:**

Flint Mayor Dayne Walling  
DEQ Director Dan Wyant  
DHHS Director Nick Lyon  
Dr. Eden Wells, DHHS  
Ridgeway White, Mott Foundation  
Harvey Hollins

**Non-Speaking Invitees: (all attendance unconfirmed)**

Sen. Jim Ananich  
Rep. Tim Greimel  
Rep. Phil Phelps  
Rep. Sheldon Neely  
Flint City Councilmembers  
Faith Based Community members  
U of M Flint Chancellor Susan Borrego (RDS talked to 10/7/15 at the Higher Ed Summit)  
Amy Hovey, Staff of Congressman Dan Kildee  
Jamie Gaskin, CEO of Genesee County United Way  
Tim Herman, CEO of Flint and Genesee Chamber of Commerce  
Brian Larkin, Flint and Genesee Chamber of Commerce (fmr. EO staff)

**Agenda:**

10:00 AM – 10:01 AM Harvey Hollins kicks off press conference; introduces Governor  
10:01 AM – 10:05 AM Governor gives remarks  
10:05 AM – 10:06 AM Harvey Hollins introduces Mayor Dayne Walling  
10:06 AM – 10:10 AM Mayor Walling gives remarks  
10:10 AM – 10:11 AM Harvey Hollins introduces DEQ Director Dan Wyant  
10:11 AM – 10:15 AM Director Wyant gives remarks  
10:15 AM – 10:16 AM Harvey Hollins introduces DHHS Director Nick Lyon  
10:16 AM – 10:17 AM Director Nick Lyon brief comments, introduces Dr. Eden Wells  
10:17 AM – 10:20 AM Dr. Eden Wells remarks

10:20 AM – 10:21 AM Harvey Hollins introduces Ridgway White of Mott Foundation  
10:21 AM – 10:25 AM Ridgway White gives remarks  
10:25 AM – 10:35 AM Q&A from the podium (SW to moderate)  
10:35 AM Event concludes; Governor departs

#### OPEN Press

#### High level points:

- Protecting the health and safety of our residents in Flint and across Michigan is always our top priority.
  - All Michigan residents need access to safe, clean water
- That's why today, in consultation with health and water experts in our state agencies, I'm advocating reconnecting the Flint drinking water with the Great Lakes Water Authority.
- I'm recommending to my partners in the Legislature that the state government provide \$6 million of the needed \$12 million to reconnect with authority.
  - The Flint city government has agreed to cover \$2 million of this cost, and the Charles Stewart Mott Foundation is generously offered to donate \$4 million.
- What you are seeing here today is a community coming together to work toward solving a problem.
  - I appreciate the assistance of Mayor Walling, and the U.S. Environmental Protection Agency.
  - This is a collaborative approach, and I appreciate that community organizations including the United Way and come forward to assist.

#### Attachments:

1. Briefing
2. FAQs for Media Q&As
3. Press Release



Briefing.pdf



FAQs for Media  
Q&As.pdf



Press Release.pdf

#### \*\*\*Staff/Detail\*\*\*

Venue POC: Kathryn Thomas (mobile)  
Security POC: Phil Snyder (mobile)  
Advance: CLU  
Comms: All

**PPI**

## **DEQ and EPA Briefing on Flint Water**

September 23, 2015

9:00am -10:00am

Introductions

Dan Wyant

EPA Update

Tinka Hyde

Elected Officials Updates

Congressman Kildee

US Senator Stabenow's office

Senator Ananich

Representative Neeley

Representative Phelps

DEQ Updates and Background

Liane Shekter-Smith, Steve Busch

Questions and Answers

All

## 02310 - Flint PbCu 1st 1/2 2015

| Pb | Cu |     |
|----|----|-----|
| 1  | 0  | 0   |
| 2  | 0  | 0   |
| 3  | 0  | 0   |
| 4  | 0  | 0   |
| 5  | 0  | 0   |
| 6  | 0  | 0   |
| 7  | 0  | 0   |
| 8  | 0  | 0   |
| 9  | 0  | 0   |
| 10 | 0  | 0   |
| 11 | 0  | 0   |
| 12 | 1  | 0   |
| 13 | 1  | 0   |
| 14 | 1  | 0   |
| 15 | 1  | 0   |
| 16 | 2  | 0   |
| 17 | 2  | 0   |
| 18 | 2  | 0   |
| 19 | 2  | 0   |
| 20 | 2  | 0   |
| 21 | 2  | 0   |
| 22 | 2  | 0   |
| 23 | 2  | 0   |
| 24 | 2  | 0   |
| 25 | 2  | 0   |
| 26 | 2  | 0   |
| 27 | 3  | 0   |
| 28 | 3  | 0   |
| 29 | 3  | 0   |
| 30 | 3  | 0   |
| 31 | 3  | 0   |
| 32 | 3  | 0   |
| 33 | 3  | 0   |
| 34 | 3  | 2   |
| 35 | 3  | 50  |
| 36 | 3  | 50  |
| 37 | 4  | 50  |
| 38 | 4  | 60  |
| 39 | 4  | 60  |
| 40 | 5  | 60  |
| 41 | 5  | 60  |
| 42 | 5  | 60  |
| 43 | 5  | 60  |
| 44 | 5  | 70  |
| 45 | 5  | 70  |
| 46 | 5  | 80  |
| 47 | 5  | 80  |
| 48 | 6  | 80  |
| 49 | 6  | 100 |
| 50 | 6  | 100 |
| 51 | 6  | 100 |
| 52 | 7  | 100 |
| 53 | 7  | 110 |
| 54 | 7  | 110 |
| 55 | 7  | 110 |
| 56 | 8  | 130 |
| 57 | 8  | 140 |
| 58 | 9  | 140 |
| 59 | 10 | 150 |
| 60 | 10 | 160 |
| 61 | 11 | 160 |
| 62 | 13 | 170 |
| 63 | 18 | 190 |
| 64 | 21 | 200 |
| 65 | 22 | 270 |
| 66 | 29 | 280 |
| 67 | 42 | 310 |
| 68 | 42 | 520 |

90th = 61.2

|         |      |         |
|---------|------|---------|
| 90th    | 11.4 | 160 ppb |
| average | 5.93 | 65.32   |
| max     | 42   | 520     |
| min     | 0    | 0       |
| # > AL  | 7    | 0       |

## 02310 - Flint PbCu 1st 1/2 2015

| Pb | Cu |     |
|----|----|-----|
| 1  | 0  | 130 |
| 2  | 0  | 0   |
| 3  | 0  | 0   |
| 4  | 0  | 0   |
| 5  | 0  | 0   |
| 6  | 0  | 0   |
| 7  | 0  | 60  |
| 8  | 0  | 100 |
| 9  | 0  | 60  |
| 10 | 0  | 0   |
| 11 | 0  | 0   |
| 12 | 1  | 0   |
| 13 | 1  | 190 |
| 14 | 1  | 0   |
| 15 | 1  | 80  |
| 16 | 2  | 140 |
| 17 | 2  | 520 |
| 18 | 2  | 2   |
| 19 | 2  | 0   |
| 20 | 2  | 0   |
| 21 | 2  | 0   |
| 22 | 2  | 0   |
| 23 | 2  | 60  |
| 24 | 2  | 80  |
| 25 | 2  | 0   |
| 26 | 2  | 0   |
| 27 | 3  | 0   |
| 28 | 3  | 110 |
| 29 | 3  | 200 |
| 30 | 3  | 0   |
| 31 | 3  | 60  |
| 32 | 3  | 60  |
| 33 | 3  | 0   |
| 34 | 3  | 0   |
| 35 | 3  | 280 |
| 36 | 3  | 0   |
| 37 | 4  | 0   |
| 38 | 4  | 0   |
| 39 | 4  | 110 |
| 40 | 5  | 0   |
| 41 | 5  | 100 |
| 42 | 5  | 100 |
| 43 | 5  | 0   |
| 44 | 5  | 110 |
| 45 | 5  | 80  |
| 46 | 5  | 0   |
| 47 | 5  | 50  |
| 48 | 6  | 270 |
| 49 | 6  | 170 |
| 50 | 6  | 0   |
| 51 | 6  | 50  |
| 52 | 7  | 160 |
| 53 | 7  | 70  |
| 54 | 7  | 70  |
| 55 | 7  | 140 |
| 56 | 8  | 0   |
| 57 | 8  | 150 |
| 58 | 9  | 60  |
| 59 | 10 | 160 |
| 60 | 10 | 0   |
| 61 | 11 | 50  |
| 62 | 13 | 100 |
| 63 | 18 | 0   |
| 64 | 21 | 0   |
| 65 | 22 | 310 |
| 66 | 29 | 0   |
| 67 | 42 | 0   |
| 68 | 42 | 0   |

90th = 61.2

|         |      |       |
|---------|------|-------|
| 90th    | 11.4 | 98    |
| average | 5.93 | 66.37 |
| max     | 42   | 520   |
| min     | 0    | 0     |
| # > AL  | 7    | 0     |

98 160 Pb

66.37

## **Thelen, Mary Beth (DEQ)**

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**From:** Shekter Smith, Liane (DEQ)  
**Sent:** Wednesday, October 07, 2015 6:51 PM  
**To:** Shaler, Karen (DEQ)  
**Cc:** Pallone, Maggie (DEQ); Krisztian, George (DEQ); Thelen, Mary Beth (DEQ); Busch, Stephen (DEQ); Benzie, Richard (DEQ); Devereaux, Tracy Jo (DEQ); Dykema, Linda D. (DHHS)  
**Subject:** RE: DRAFT Summary Protocol Document  
**Attachments:** DRAFT Recommended Screening Strategies for Assessing and Reducing Lead in Drinking Water in Schools.docx

With the attachment....

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**From:** Shekter Smith, Liane (DEQ)  
**Sent:** Wednesday, October 07, 2015 6:50 PM  
**To:** Shaler, Karen (DEQ)  
**Cc:** Pallone, Maggie (DEQ); Krisztian, George (DEQ); Thelen, Mary Beth (DEQ); Busch, Stephen (DEQ); Benzie, Richard (DEQ); Devereaux, Tracy Jo (DEQ); Dykema, Linda D. (DHHS)  
**Subject:** DRAFT Summary Protocol Document

For the Director. Not for inclusion in the Governor's package.



## Strategy for Assessing and Reducing Lead in Drinking Water in Schools

### Summary

**Objective:** To determine the levels of lead (Pb) at cooking and drinking water outlets within schools served by the city of Flint municipal water supply.

#### Action Steps:

- **Develop a Sampling Plan**

Detailed instructions will be provided to each school regarding actions to be taken the day prior to sampling and the day of sampling.

Each tap/outlet used for cooking or drinking water will be sampled.

Samples will be collected at prescribed intervals to determine whether (1) an outlet is a source of lead, (2) the supply pipe is a source of lead, (3) brief flushing may provide reduced lead levels. Other samples, as necessary, to identify a unique concern identified by the plumbing assessment.

All samples will be analyzed by the MDEQ certified drinking water laboratory.

- **Develop a Plumbing Profile**

By identifying what materials are used in facility plumbing, and where they are located, it is possible to determine where monitoring and what sampling regimen will be effective in analyzing water likely to contain lead.

A plumbing assessment will assist in determining how the potable water piping flows in the building and the order in which samples will be collected.

- **Evaluate the Analytical Results**

The analytical results will be evaluated and compared to the 15 ppb Pb action level benchmark established by U.S. EPA in the federal lead and copper rule in the Safe Drinking Water Act.

- Action in Response to Findings

Any tap/outlet with lead levels that exceed 15 ppb may be resampled, removed from service, or other measure(s) taken. Short term and more permanent measures/controls will be identified.

- Follow-up Sampling

Follow-up sampling may be necessary to ensure that any site specific measures/controls have been effective.

- Communication

An effective communications strategy is critical to explain potential risks, describe technical solutions and build trust among parents, school and local health department officials, and the water supplier. Public health agencies will provide information to assist schools with their communications.

Development of this summary protocol is based on U.S. EPA technical guidance entitled "3Ts for Reducing Lead in Drinking Water in Schools (EPA 816-B-05-008)", the American Water Works Association guidance "Assisting Schools and Child Care Facilities in Addressing Lead in Drinking Water" and other state and local health department school lead sampling and assessment guidance.

# **City of Flint, Michigan**

*Third Floor, City Hall  
1101 S. Saginaw Street  
Flint, Michigan 48502  
[www.cityofflint.com](http://www.cityofflint.com)*



## **Meeting Minutes - Draft**

**Monday, March 25, 2013**

**5:33 PM**

**Agenda amended to include Board of Hospital Managers appointments**

**Council Chambers**

### **CITY COUNCIL**

**Scott Kincaid, President, Ward 9**  
**Bryant W. Nolden, Vice President, Ward 3**

**Claudia Croom, Ward 1**

**Joshua M. Freeman, Ward 4**

**Sheldon A. Neeley, Ward 6**

**Jacqueline Poplar, Ward 2**

**Bernard Lawler, Ward 5**

**Dale K. Weighill, Ward 7**

**Michael J. Sarginson, Ward 8**

**Inez M. Brown, City Clerk**

## CALL TO ORDER

*President Scott Kincaid called the meeting to order at 5:33 p.m.*

## ROLL CALL

*Councilperson Michael Sarginson arrived at 5:37 p.m.*

**Present:** Councilperson: Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, Kincaid, Councilperson Weighill and Councilperson Croom

## PLEDGE OF ALLEGIANCE

*Councilperson Sheldon Neeley led the Pledge of Allegiance.*

## SPECIAL ORDER

**130217** Special Order/Information & Discussion/Karegnondi Water Authority (KWA)

A Special Order as requested by Council President Scott Kincaid to continue discussion and review of information on the Karegnondi Water Authority (KWA).

**Presented**

## PETITIONS AND UNOFFICIAL COMMUNICATIONS

**130193** Change to Digital/All Limited Basic Service Channels/Comcast Cablevision

Communication dated March 6, 2013, from Gerald W. Smith, Government Affairs Manager, Comcast, to Flint City Clerk, re: On or shortly after April 9, 2013, Comcast will convert all Limited Basic service channels -- including Public, Government and Educational Access (PEG) channels to digital format, and will provide customers with digital equipment.

**This matter was Placed on File. The motion carried.**

**130199** Certified Letter/Loyst Fletcher, Jr. & Associates

Communication received from Loyst Fletcher, Jr. to Chief Legal Officer, re: He questions the tax-exempt status of Word of Life Christian Church, which received a tax bill from the city.

**This matter was Placed on File. The motion carried.**

**130200** Local Approval Notice/Michigan Liquor Control Commission (MLCC)/Time Square/Ward 3

Local Approval Notice dated March 14, 2013, from MLCC to Flint City Clerk, re: The MLCC has received a request to transfer all stock in 2012 Class C license with Sunday Sales Permit (PM) and Dance Permit, located at 4522 N. Saginaw,

Flint, Michigan, 48505, Genesee County, held by the estate of Myra Seals, Inc., 1028 Cora Dr., Flint, MI 48532, to Carisa Mays Bishop, Personal Representative. [NOTE: Approval order enclosed.]

**This matter was Placed on File. The motion carried.**

- 130202** Local Approval Notice/Michigan Liquor Control Commission (MLCC)/D & R Market, Inc./Ward 6

Local Approval Notice dated March 6, 2013, and received March 15, 2013, from MLCC to Flint City Clerk, re: The MLCC has received an application from 2 AAR, LLC, requesting to Transfer Ownership of a Specially Designated Distributor (SDD) and Specially Designated Merchant (SDM) licensed business with Sunday Sales permit (PM) and Direct Connection-I to D & R Market, Inc., located at 1402-1404 N. Chevrolet, Flint, Michigan, 48504, Genesee County, from 2 AAR, LLC, 3079 Shattuck Arms Blvd., Apt. 5, Saginaw, MI 48603. [NOTE: The application was cancelled pursuant to a request from an attorney.]

**This matter was Placed on File. The motion carried.**

- 130204** Changes/Cable Channel Lineup/Comcast Cablevision

Communication dated March 18, 2013, from Gerald W. Smith, Government Affairs Manager, Comcast, to Flint City Clerk, re: effective on or about May 22, 2013, Fox Business Network/Fox Business Network HD (ch. 06/243) will from the Digital Preferred Service to the Digital Starter Service.

**This matter was Placed on File. The motion carried.**

- 130205** Media Alert/Flint Public Art Project/Announcement of Design Winner

Media Alert received via e-mail on March 19, 2013, from the American Institute of Architects (AIA), re: The Flint Public Art Project and the Flint Chapter of the AIA will announce the winner of the \$25,000.00 grand prize in the inaugural Flat Lot competition to design and build a temporary summer pavilion on Flint's central downtown parking lot at 9:30 a.m. Thursday, March 21, 2013, at the John Gazall & Associates, Mott Building, 503 S. Saginaw Street, Flint.

**This matter was Placed on File. The motion carried.**

- 130207** Damage Claims

MAYFIELD, LINDA, 2518 Walter Street, Flint, MI (WARD 2)  
LANE, WILLIE C., 3130 Concord Street, Flint, MI (WARD 6)

**This matter was Placed on File. The motion carried.**

## COMMUNICATIONS FROM CITY OFFICIALS

- 130194** Press Release/City of Flint/Hiring of New Police Officers/Recruitment of Others

Press Release dated March 11, 2013, from Jason Lorenz, City of Flint Public

Information Officer, re: The City of Flint has seven new police officers on the job from the public safety millage passed last November by voters. The city's next step is to hold a recruitment drive by working with a local college, which will set up a Police Academy when the city has gathered sufficient interest from its efforts.

**This matter was Placed on File. The motion carried.**

**130195**

Press Release/City of Flint/Sunday Sales of Alcohol Before Noon Not Permitted on St. Patrick's Day

Press Release dated March 12, 2013, from Jason Lorenz, City of Flint Public Information Officer, re: The City of Flint will not be able to permit Sunday alcohol sales before noon this Sunday, March 17, St. Patrick's Day. While the city adopted a resolution to allow a one-time exception to the Sunday morning alcohol ban, the Michigan Liquor Control Commission has taken the position that the city cannot create a one-day exemption.

**This matter was Placed on File. The motion carried.**

**130196**

Flint City Council/Public Notice/Special City Council Meeting/March 18, 2013

Public Notice posted March 14, 2013, re: The Flint City Council will hold a Special City Council Meeting, followed by a Finance Committee Meeting, at 5:30 p.m. Monday, March 18, 2013, in the City Council Chambers, 3rd Floor, City Hall, to consider a contract with the Karegnondi Water Authority (KWA).

**This matter was Placed on File. The motion carried.**

**130201**

Emergency Financial Manager (EFM) Order #10/Grant Applications

Order #10 issued by Emergency Financial Manager on March 15, 2013, "Grant Applications," re: "all city officials, department heads, division heads and employees shall adhere to ...requirements regarding the approval of any and all grant applications on behalf of the City of Flint or grant applications submitted by others which in any way involves the financial, programmatic or personnel support by the City of Flint." The five requirements, including the stipulation that only the Emergency Financial Manager or City Administrator are authorized to accept grants on behalf of the city, are included in the order.

**This matter was Placed on File. The motion carried.**

**130203**

Press Release/City of Flint/Flint Lifelines/Meeting Announcement

Press Release dated March 16, 2013, from Jason Lorenz, City of Flint Public Information Officer, re: Flint Lifelines, formerly CeaseFire Flint, will hold community meetings on the fourth Thursday of each month, beginning at 1 p.m. Thursday, March 28, 2013 at Flint Northwestern High School. The meetings are open to the public.

**This matter was Placed on File. The motion carried.**

**130206** Flint City Council/Public Notice/Finance Committee Meeting/March 20, 2013

Public Notice posted March 19, 2013, re: The Flint City Council will hold a Finance Committee Meeting at 5:30 p.m. Wednesday, March 20, 2013, in the City Council Committee Room, 3rd Floor, City Hall.

**This matter was Placed on File. The motion carried.**

**130208** Flint City Council/Public Notice/Special Affairs Committee Meeting/March 25, 2013

Public Notice posted March 22, 2013, re: The Flint City Council will hold a Special Affairs Committee Meeting at 5 p.m. Monday, March 25, 2013, in the City Council Committee Room, 3rd Floor, City Hall. A regular City Council meeting will immediately follow in the Council Chambers.

**This matter was Placed on File. The motion carried.**

**130209** Traffic Engineering/Note for Bulletin/Street-Sidewalk-Lane Closures

Notes for Bulletin (3) dated February/March 2013, for street, sidewalk, or lane closures, re: (1) Harrison Street, Saginaw Street and Second Avenue (cable failure-March 11-March 20); (2) First Street, Harrison Street, Wallenberg, Kearsley, Crapo, Horrigan, and Harrison (St. Patrick's Day Pot O' Gold 4-Mil Run/Walk-March 17); and (3) Chevrolet Avenue (University Corner Grand Opening-March 22).

**This matter was Placed on File. The motion carried.**

**Passed The Consent Agenda**

**A motion was made. The motion carried.**

**PUBLIC SPEAKERS****ROLL CALL**

*Councilperson Dale Weighill left at approximately 7 p.m.*

**Present:** Councilperson: Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, Kincaid and Councilperson Croom

**Absent:** Councilperson: Councilperson Weighill

**APPOINTMENTS****130169.1** Amendment/Reappointment/Zoning Board of Appeals/Christine Monk (Ward 6)

Amended resolution resolving that the Flint City Council recommends the reappointment of Christine Monk (821 Frank Street, Flint MI 48504 - Ward 6), to the Zoning Board of Appeals for a three-year term, commencing September

1, 2011, and expiring September 1, 2014. [By way of background, Ms. Monk's term on the Zoning Board of Appeals expired in September 2011, but she has continued since that time to serve.] [Resolution amended to fix typographical error in first paragraph of resolution from "Board of Review" to "Zoning Board of Appeals."]

**Sponsors:** Sheldon A. Neeley

**A motion was made by Councilperson Neeley, seconded by Councilperson Freeman, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

**130211**

Appointment/Zoning Board of Appeals/Chris Zuwala (Ward 4)

Resolution resolving that the Flint City Council recommends the appointment of Chris Zuwala (3510 Whittier Avenue, Flint MI 48506 - Ward 4) to the Zoning Board of Appeals for a three-year term, expiring September 1, 2013. [NOTE: By way of background, Gloria Kelly's term as the 4th Ward representative expired in September 2007, but she continued to serve until resigning in January 2013.]

**Sponsors:** Joshua M. Freeman

**A motion was made by Councilperson Freeman, seconded by Councilperson Poplar, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

**130212**

Reappointment/Zoning Board of Appeals/Birdie V. Brooks (Ward 5)

Resolution resolving that the Flint City Council recommends the reappointment of Birdie V. Brooks (1307 Columbia Lane, Flint MI 48503 - Ward 5), to the Zoning Board of Appeals for the remainder of a three-year term, expiring September 1, 2014. [By way of background, Ms. Brook's term on the Zoning Board of Appeals expired in September 2011, but she has continued since that time to serve.]

**Sponsors:** Bernard Lawler

**A motion was made by Councilperson Lawler, seconded by Councilperson Neeley, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

**130213**



Resolution resolving that the Flint City Council recommends the reappointment of Marcia Braden (984 Barney Avenue, Flint MI 48503 - Ward 8), to the Zoning Board of Appeals for the remainder of a three-year term, expiring September 1, 2014. [By way of background, Ms. Braden's term on the Zoning Board of Appeals expired in September 2011, but she has continued since that time to serve.]

**Sponsors:** Michael J. Sarginson

**A motion was made by Councilperson Sarginson, seconded by Councilperson Freeman, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

130214

Reappointment/Zoning Board of Appeals/David C. Veasley (Ward 9)

Resolution resolving that the Flint City Council recommends the reappointment of David C. Veasley (2618 Pinetree Drive, Flint MI 48507 - Ward 9), to the Zoning Board of Appeals for the remainder of a three-year term, expiring September 1, 2015. [By way of background, Mr. Veasley's term on the Zoning Board of Appeals expired in September 2009, but he has continued since that time to serve.]

**Sponsors:** Scott Kincaid

**A motion was made by Councilperson Freeman, seconded by Vice President Nolden, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

130215

Appointment/Genesee County Land Bank Citizens' Advisory Council/Anthony Tucker (Ward 4)

Resolution resolving that the Flint City Council recommends the appointment of Anthony Tucker (2960 Henry Street, Flint MI 48506 - Ward 4) to the Genesee County Land Bank Citizens' Advisory Council for the remainder of a three-year term, expiring in January 2016. [NOTE: By way of background, Dan Anderson's term as the 4th Ward representative expired in January 2013.]

**Sponsors:** Joshua M. Freeman

**A motion was made by Councilperson Freeman, seconded by Councilperson Poplar, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

**130218** Reappointment/Hurley Board of Hospital Managers/Philip W. Shaltz

Resolution resolving that the Flint City Council approves the reappointment of Philip W. Shaltz (14144 Moffet Drive, Fenton, MI 48430) to an additional five-year term on the (Hurley) Board of Hospital Managers, with such term to commence May 1, 2013, and expire April 30, 2018.

**A motion was made by Councilperson Freeman, seconded by Vice President Nolden, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

**130219** Appointment/Hurley Board of Hospital Managers/Delrico Loyd

Resolution resolving that the Flint City Council approves the appointment of Delrico Loyd (2641 Westwood Parkway, Flint, MI 48507) to a five-year term on the (Hurley) Board of Hospital Managers, with such term to commence May 1, 2013, and expire April 30, 2018. [By way of background, Carl E. Mason was appointed in June 2008; his term expires April 30, 2013.]

**Approved**

**Substituted**

**A motion was made by Councilperson Neeley, seconded by Councilperson Lawler, that this matter be POSTPONED for March 27, 2013. The motion failed by the following vote:**

**Aye:** 3 - Councilperson Lawler, Councilperson Neeley and Councilperson Sarginson

**No:** 5 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

**Substituted**

**A motion was made by Vice President Nolden, seconded by Councilperson Freeman, that this matter be Approved. The motion carried by the following vote:**

**Aye:** 5 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, President Kincaid and Councilperson Croom

**No:** 3 - Councilperson Lawler, Councilperson Neeley and Councilperson Sarginson

**Absent:** 1 - Councilperson Weighill

**130220** Appointment/Hurley Board of Hospital Managers/Donna Poplar

Resolution resolving that the Flint City Council approves the appointment of Donna Poplar (5277 Kimberly Woods Circle, Flint, MI 48504) to a five-year term

on the (Hurley) Board of Hospital Managers, with such term to commence May 1, 2013, and expire April 30, 2018. [By way of background, Frances Gilcreast was appointed in August 2008; her term expires April 30, 2013.]

**Approved**

**Substituted**

**A motion was made by Councilperson Lawler, seconded by Councilperson Neeley, that this matter be POSTPONED for March 26, 2013. The motion carried by the following vote:**

**Aye:** 7 - Councilperson Poplar, Vice President Nolden, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**No:** 1 - Councilperson Freeman

**Absent:** 1 - Councilperson Weighill

## RESOLUTIONS

### 130165.1 Amended Resolution/Contract/City of Flint/Karegnondi Water Authority (KWA)

Amended resolution resolving that city officials are authorized to enter into a contract with Karegnondi Water Authority (KWA) to purchase fifteen (15) units of capacity, AND, resolving that the City Administrator is authorized to provide KWA information needed to administer the contract, and, with approval of the Chief Legal Officer, to make minor (non-material) modifications to the contract. [NOTE: For each unit of capacity that a member purchases, the buyer shall pay to the KWA a one-time fee of \$32,300. Additionally, the buyer shall pay to the KWA not less than \$32,300.00 per unit per year until such time as water is made available to the buyer. After water is made available, the buyer shall pay to the KWA an estimated amount NOT-TO-EXCEED \$355,300.00 per unit per year until such time that the bonds are paid in full. If it is determined that the costs per unit will exceed \$355,300.00, the buyer has a right to cancel the contract. Over the next 25 years, it is expected that continuing with Detroit will cost the region \$2.1 billion, compared to \$1.9 billion with a pipeline.] [NOTE: Contract not included.] [NOTE: Resolution amended from 18 to 15 units of capacity.]

**A motion was made by Councilperson Neeley, seconded by Councilperson Freeman, that this matter be Amended. The motion carried by the following vote:**

**Aye:** 5 - Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley and Councilperson Sarginson

**No:** 3 - Councilperson Poplar, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

### 130165.2 Amended Resolution/Contract/City of Flint/Karegnondi Water Authority (KWA)

Amended resolution resolving that city officials are authorized to enter into a contract with Karegnondi Water Authority (KWA) to purchase sixteen (16) units

of capacity, AND, resolving that the City Administrator is authorized to provide KWA information needed to administer the contract, and, with approval of the Chief Legal Officer, to make minor (non-material) modifications to the contract. [NOTE: For each unit of capacity that a member purchases, the buyer shall pay to the KWA a one-time fee of \$32,300. Additionally, the buyer shall pay to the KWA not less than \$32,300.00 per unit per year until such time as water is made available to the buyer. After water is made available, the buyer shall pay to the KWA an estimated amount NOT-TO-EXCEED \$355,300.00 per unit per year until such time that the bonds are paid in full. If it is determined that the costs per unit will exceed \$355,300.00, the buyer has a right to cancel the contract. Over the next 25 years, it is expected that continuing with Detroit will cost the region \$2.1 billion, compared to \$1.9 billion with a pipeline.] [NOTE: Contract not included.] [NOTE: Resolution amended from 15 to 16 units of capacity.]

**A motion was made by Councilperson Neeley, seconded by Councilperson Freeman, that this matter be Adopted. The motion carried by the following vote:**

**Aye:** 7 - Councilperson Poplar, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**No:** 1 - Vice President Nolden

**Absent:** 1 - Councilperson Weighill

**130216**

Approval/The First Amendment & Restated Rules Governing the Downtown Development Authority (DDA) of the City of Flint

Resolution that the City of Flint hereby approves and The First Amendment & Restated Rules Governing the Downtown Development Authority (DDA) of the City of Flint, attached hereto. [NOTE: The City of Flint created the DDA, in accordance with Public Act 197 of 1975, as amended, and approved The Rules Governing the DDA in 1977. Public Act 197 has been amended and revised at various times since then, which required the proposed changes.] [NOTE: The First Amendment & Restated Rules Governing the Downtown Development Authority (DDA) of the City of Flint is attached.]

**A motion was made by Councilperson Freeman, seconded by Vice President Nolden, that this matter be Amended. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

**130216.1**

Amended Resolution/Approval/The First Amendment & Restated Rules Governing the Downtown Development Authority (DDA) of the City of Flint

Amended resolution that the City of Flint hereby approves and The First Amendment & Restated Rules Governing the Downtown Development Authority (DDA) of the City of Flint, attached hereto. [NOTE: The City of Flint created the DDA, in accordance with Public Act 197 of 1975, as amended, and approved The Rules Governing the DDA in 1977. Public Act 197 has been

amended and revised at various times since then, which required the proposed changes.] [NOTE: The First Amendment & Restated Rules Governing the Downtown Development Authority (DDA) of the City of Flint is attached.] [Resolution amended for changes to rules.]

**A motion was made by Councilperson Freeman, seconded by Vice President Nolden, that this matter be Adopted. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

## **RESOLUTIONS - MAY BE REFERRED FROM S.A.**

**130210** Resolution/City Council/Mayor Dayne Walling/Request for Appointment of Transition Advisory Board

Resolution resolving that Mayor Dayne Walling and the Flint City Council request and recommend to Gov. Rick Snyder that a receivership transition advisory board be appointed for the City of Flint under Public Act 436 no later than July 1, 2013. [NOTE: On December 1, 2011, Gov. Snyder appointed Michael K. Brown as Emergency Manager under Public Act 4 for the City of Flint, due in part to a consistent deficit in the general fund, the decline in pooled cash, budget issues and unfunded liabilities for post-employment benefits. Due to the suspension and subsequent repeal of Public Act 4, Gov. Snyder appointed Edward J. Kurtz as Emergency Financial Manager under Public Act 72 for the City of Flint, effective August 9, 2012. Both the Emergency Manager and the subsequently appointed Emergency Financial Manager were authorized by virtue of their appointment to "act for and in the place and stead of the governing body and the office of chief administrative officer of the City of Flint." On March 28, 2013, Public Act 436 will become effective and provides that an emergency financial manager appointed and serving under state law immediately prior to the effective date shall continue to serve as an emergency manager under Public Act 436. As an alternative to continuation of an emergency manager, and if the financial emergency has been rectified, Public Act 436 authorizes the governor to appoint a receivership transition advisory board, which serves at the pleasure of the governor and monitors the affairs of the local government until the receivership is terminated.]

*No vote was taken on this amendment.*

### **Amended**

**130210.1** Amended Resolution/City Council/Mayor Dayne Walling/Request for Appointment of Transition Advisory Board

Amended resolution resolving that Mayor Dayne Walling and the Flint City Council request and recommend to Gov. Rick Snyder that a receivership transition advisory board be appointed for the City of Flint under Public Act 436 no later than July 1, 2013. [NOTE: On December 1, 2011, Gov. Snyder appointed Michael K. Brown as Emergency Manager under Public Act 4 for the

City of Flint, due in part to a consistent deficit in the general fund, the decline in pooled cash, budget issues and unfunded liabilities for post-employment benefits. Due to the suspension and subsequent repeal of Public Act 4, Gov. Snyder appointed Edward J. Kurtz as Emergency Financial Manager under Public Act 72 for the City of Flint, effective August 9, 2012. Both the Emergency Manager and the subsequently appointed Emergency Financial Manager were authorized by virtue of their appointment to "act for and in the place and stead of the governing body and the office of chief administrative officer of the City of Flint." On March 28, 2013, Public Act 436 will become effective and provides that an emergency financial manager appointed and serving under state law immediately prior to the effective date shall continue to serve as an emergency manager under Public Act 436. As an alternative to continuation of an emergency manager, and if the financial emergency has been rectified, Public Act 436 authorizes the governor to appoint a receivership transition advisory board, which serves at the pleasure of the governor and monitors the affairs of the local government until the receivership is terminated.] [Six-page resolution amended for changes proposed by City Council, City Clerk and Mayor Dayne Walling.]

**A motion was made by Councilperson Freeman, seconded by Councilperson Poplar, that this matter be Adopted. The motion carried by the following vote:**

**Aye:** 8 - Councilperson Poplar, Vice President Nolden, Councilperson Freeman, Councilperson Lawler, Councilperson Neeley, Councilperson Sarginson, President Kincaid and Councilperson Croom

**Absent:** 1 - Councilperson Weighill

## **MEETING SCHEDULE**

## **ADDITIONAL COUNCIL DISCUSSION**

## **ADJOURNMENT**

*Having no further business, Council President Scott Kincaid adjourned the meeting at 8:59 p.m.*

*Respectfully transcribed and submitted,*

*Janell Johnson. Administrative Secretary to City Council*



## CITY OF FLINT

**Dayne Walling**  
Mayor

January 18, 2015

The Honorable Rick Snyder  
Governor, State of Michigan  
P.O. Box 30013  
Lansing, MI 48909

**RE: Flint Water Improvement Plan**

Dear Governor Snyder:

On behalf of the Flint community, I am writing to convey serious concerns about water quality and to request your support for my proposed Flint Water Improvement Plan. Access to safe and clean water is a basic human right, and, therefore, policy and budget decisions need to ensure that water is affordable and secure for everyone in Flint and all across Michigan. It is essential there is City, State and Federal cooperation to address the challenges here and to meet the needs of vulnerable populations.

The Flint Water Improvement Plan is focused in five areas: safety, quality, access, investment and education. The plan puts safety and quality first because this is fundamental. It is designed to be a sustainable solution for the City of Flint and the community as we move towards a new permanent water supply from Lake Huron through the Karegnondi Water Authority. My plan offers new ideas and also builds on successful models of utility, energy and assistance programs at the State and Federal levels.

Safety & Quality

- 100% Safety is the standard
- City of Flint reports testing data to the public to assure safety and expands testing sites and frequency
- Bring on experienced river water treatment operational management in the City of Flint

Access

- Announce an amnesty program for Flint water service turn-ons and reduce the turn-on fee
- Develop a revised affordable payment plan policy to encourage customers to return
- Design Federal and State partnership to establish new Drinking Water Emergency Assistance Fund for the elderly and vulnerable families

Investment

- Accelerate water system improvements outlined in the City of Flint Capital Improvement Plan through Federal and State Investments
  - State approves City of Flint's Distressed Cities Fund applications

- Federal and State support for replacement or forgiveness of payment to the Drinking Water Revolving Loan Fund due to Flint's status as a distressed community
- Federal and State grants for infrastructure improvements in alignment with the Flint Master Plan
- City Water Department implements budgeted FY15 projects including leak detection, valve repairs, new pipes and meter replacements

#### Education

- Develop a community partnership with universities to provide household and business customers with information on testing and conservation
- Ongoing partnership with Michigan Department of Human Services, United Way, Salvation Army and community organizations to provide information and water assistance with the Keep the Water Flowing Fund and support services
- Expand youth energy initiative to assist households with conservation and efficiency (piloted in summer 2014 with Northwestern High School students, EcoWorks and Consumers Energy)

It is also critical to restore the public confidence in Flint Water. The implementation of this plan must be accompanied by extensive community engagement including local elected officials. My objective is to work with you and your appointed officials, State Senator Ananich, State Representatives Phelps and Neeley, Congressman Kildee, community groups, businesses, churches, foundations, the Flint City Council, and all of the City of Flint and government personnel.

It is imperative that we communicate better and provide residents more information. I understand representatives from the Michigan Department of Environmental Quality will be joining a public forum this week at City Hall. This engagement going forward is vital so thank you for supporting their efforts. I think this issue of transparency is important for communities all across the State. I recommend a review of the applicable laws and policies and, at a minimum, a new requirement that water testing data be reported publicly no less than quarterly by law in all Michigan communities in Flint's population category.

Thank you for the consideration Governor. There is nothing more important in Flint right now than fixing the water problems. We must work together to identify funds to repair and update the water treatment facilities and city-wide infrastructure and to help those persons without access to clean water so that the entire Flint community has sustainable, safe, secure and affordable water now and into the future. This is an important issue for the state of our State of Michigan and I urge you to work with us to implement solutions.

Sincerely,



Dayne Walling, Mayor  
City of Flint

CC: Flint City Council President Joshua Freeman; Congressman Dan Kildee; State Senator Jim Ananich; State Representative Sheldon Neeley; State Representative Phil Phelps; Flint Emergency Manager Jerry Ambrose



# Lead in Drinking Water

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## Preliminary Assessment

U.S. EPA Flint Task Force

12/22/2015

DRAFT

## 1.0 Overview

The United States Environmental Protection Agency (EPA) has offered, and the City of Flint has accepted, the assistance of EPA experts on corrosion and corrosion control. This preliminary assessment is intended to document the activities and funding necessary to enable EPA to provide advice and support to the City of Flint in optimizing and maintaining corrosion control treatment under current water quality conditions as well as during and after the upcoming transition to the Karegnondi Water Authority (KWA) pipeline.

[Note: There are many other communities scheduled to transition from their current water sources to the KWA pipeline. Although the source water will be the same for the City of Flint and all communities transitioning to the KWA pipeline source, the intended treatment planned for these communities may differ and the studies undertaken for the City of Flint may or may not be suitable for use by the other communities. It is strongly recommended that the EPA Task Force discuss with the Michigan Department of Environmental Management (MDEQ) the importance of actively working with these additional communities to ensure that proper studies on optimizing and maintaining OCCT are undertaken prior to putting the new KWA source in service for all affected communities. If such studies are not currently underway, they should be initiated as soon as possible.]

## 2.0 Information Request

In order to provide effective advice and assistance, the EPA Task Force should request the following information from the City of Flint.

### 2.1 Current inventory of homes with service line information in excel or similar format.

Use of GIS?  
Record list?

Pipe loops are corrosion control treatment assessment tools that enable evaluation of the effects of potential water quality changes and different levels of orthophosphate treatment on the existing pipe scales in order to select the most effective treatment before the treatment is applied on a city-wide basis. The pipe loops utilize lead service lines that are actively in service and carefully extracted so that the treatment assessment is conducted with pipes that represent conditions within the distribution system. As it would not be possible to perform service line extractions in the winter without significantly altering or dislodging the scales within the pipes, the identification and extraction of lead service lines should be given the highest priority to ensure that a sufficient number of lead pipes can be identified and extracted as soon as possible. In order to identify suitable homes with lead lines, the EPA Task Force will need current records on lead service line locations to be provided as soon as possible so that sampling can be coordinated and conducted to verify the presence of lead lines.

what is current location then?

To minimize the need for excavation, homes with the longest lead service lines should be chosen so that multiple segments can be harvested from each lead line. The lead lines would typically be the longest where the water main is located across the street from the home and the home is set back on the property with respect to the street. An estimated 20 lead pipe segments should be carefully extracted and handled using ORD-specified procedures for use in constructing pipe loops at the treatment plant.

As the scales within the service lines have been subject to significant and iterative water quality changes in a relatively short period of time, it is also necessary to extract additional lead and non-lead portions of service lines to assess the current condition of the scales within the service lines.

- 2.2 All lead in water testing results for City of Flint, including those not used for Lead and Copper Rule compliance.

George  
Adair's  
data?

Studies have shown that homes served by lead service lines generally have much higher lead levels than homes without lead service lines. As it is anticipated that the City of Flint's service line records will be incomplete, the lead-in-water testing data is a supplemental tool that can be mapped to identify areas of the city that may have higher lead-in-water levels which would indicate the presence of lead service lines. This information will help the EPA Task Force in the identification and extraction of lead service lines for constructing the pipe loops and in identification of areas to test the progress of corrosion control.

- 2.3 Identification of areas in Flint with elevated blood lead levels.

GCAD ~~of~~ DHS should  
have specific  
data for  
EOLL cases

Similar to the lead-in-water testing, identification of areas (e.g., zip codes, neighborhoods) where elevated blood lead levels are found can provide additional data which would indicate the presence of lead service lines for the identification of areas to test the progress of corrosion control.

EOLL Investigation consecutive  
sampling  
results

- 2.4 Addresses of homes that have had water service interruptions or street disturbances (e.g., water main breaks, road/sidewalk construction, etc.) within the last year.

city

Streets where there have been potential physical disturbances and homes where the water service has been interrupted should be prioritized for evaluation for the presence of lead service lines as the disturbances can release very high lead and prolonged stagnation can affect the stability of the scales within the pipes.

- 2.5 Addresses of currently unoccupied homes.

city  
-land bank?

Similar to homes where the water service has been interrupted, homes that are unoccupied should be prioritized for evaluation for the presence of lead service lines as these homes may pose a significant risk to incoming occupants if the home has a lead service line. Recently unoccupied homes also may provide important evaluation locations of water usage impacts on scale stability and lead release/exposure.

- 2.6 Identification of the pressure zones and location of each of the water quality parameter locations (addresses) within each pressure zone used for water quality parameter measurements (pH, alkalinity, orthophosphate, chlorine, total Coliform) in the distribution system, along with copies of the water quality parameter analytical results for past 4 rounds of monitoring.

WQP  
provided  
to Bureau by

In addition to corrosion control treatment optimization, the City of Flint must simultaneously comply with all other applicable National Primary Drinking Water Regulations (NPDWRs). A system-wide assessment of the water quality will provided information necessary to ensure that any potential issues with other NPDWRs can be identified and resolved. Information regarding the water quality in the distribution system is necessary to evaluate the stability of the water quality parameters throughout the distribution system, and to detect locations that may have the highest risk of lead release, TTHM formation, or the presence of microbial contamination.

### **3.0 Immediate Tasks and Timeline**

The following tasks should be undertaken immediately (November/December 2015)

- 3.1 Determination on EPA funding commitment(s) (DRA).
- 3.2 Discussion with Central Regional Laboratory (CRL) regarding laboratory capabilities and support (GWDWB, ORD).
- 3.3 Development of EPA QAPPs encompassing the following activities (GWDWB, ORD, Others\*):
  - 3.3.1 Verification of presence of lead service lines\*;
  - 3.3.2 Pipe rig construction, operation, and maintenance;
  - 3.3.3 Treatment assessment monitoring;
  - 3.3.4 Evaluation of lead reservoirs within service lines; and
  - 3.3.5 Evaluation of scale degradation due to stagnation events at unoccupied homes and water shut-offs\*.

\*If these activities are undertaken by one or more of the local partners, QAPP development should be part of the agreement.

- 3.4 Identification of local partners that can coordinate with the EPA Flint Task Force, MDEQ, and the City of Flint, and establishment of agreements to provide assistance on field and other activities (ORD).  
[Potential local partners who have expressed strong interest and willingness to collaborate with EPA include Wayne State University, University of Michigan Flint, Michigan State University, Hurley Medical Center, and Genesee County Health Department.]
- 3.5 Outreach and education – specifics to be determined.  
[Potential local partners Hurley and WSU have asked ORD directly if EPA can provide training/education for their staff on lead in water occurrence, sampling for lead, and corrosion/corrosion control treatment]
- 3.6 Assessment of information from 2.1 to verify the presence of a sufficient number of accessible homes with lead service lines that can be extracted for construction of pipe loops and to evaluate the current state and stability of the scales within the lead and non-lead portions of service lines (TBD).
- 3.7 Extraction of approximately twenty lead line segments with active water for construction of pipe loops, and six additional full service lines with different pipe material (two with lead and galvanized iron, two with lead and copper, and two with lead and plastic segments) for analyzing the lead reservoirs within the lead and non-lead segments of the service lines (TBD).
- 3.8 Risk evaluation and communication on the potential risk from physical disturbances to lead service lines, reoccupation of unoccupied homes and re-establishment of water service following water shut-offs (TBD).

#### 4.0 Funding Needs (To Be Determined)

#### 5.0 Optimization and Maintenance of Optimal Corrosion Control Treatment

The narrative below describes the scope of work to be undertaken in providing assistance to the City of Flint and is contingent on adequate funding being provided.

##### 5.1 Lead Service Line Detection Methodology Development

Verification of the presence of lead service lines is necessary for identification and extraction of lead service lines, sampling for treatment assessment, Lead and Copper Rule compliance sampling, risk evaluation and implementation of a lead service line replacement program. Blood lead level (BLL) or other lead-related health evaluations also need to be able to identify all lead sources for blood-tested individuals to prioritize risk locations and mitigation strategies. This methodology development is designed to determine if a simple water sampling protocol can give a convenient means to verify with some level of confidence, whether or not a residence has a lead service line, through relatively non-intrusive water sampling. Experience with other utilities has shown that paper records may either under or overestimate the presence of lead service lines.

20 Nov 16  
50 PB\*  
The strategy to be employed is based on published protocols with improvements being researched by Polytechnique Montreal (Michele Prevost, Elise Deshommes, Clement Cartier). This requires staffing for coordination with Flint paper records, resident contact, plumbing mapping, field sampling (TBD, but estimated at 20 locations with no LSLs for "control" purposes, and 50 locations believed to have LSL for validation. Development of this protocol could involve re-sampling to test techniques, and could utilize one or more Palintest electrochemical analyzers after validation vs. ICP-MS. EPA-ORD has one Palintest analyzer which can be used. Field personnel would work closely with R5 CRL to test the limits of analytical performance of the Palintest analyzer.

[Note: Verification of the locations of lead service lines for compliance sampling and for corrosion control treatment assessment is a best practice for all systems.]

##### 5.2 Corrosion Control Treatment Optimization Evaluations

DWSO → The corrosion control treatment optimization evaluations are necessarily separated into two stages. The first stage is intended to optimize corrosion control treatment with the current water source and water quality conditions. The second stage is designed to prepare for the transition to the new water source (KWA Pipeline) and water quality conditions, and to ensure that the City of Flint is able to simultaneously comply with all National Primary Drinking Water Regulations following the transition to the new source.

5.2.1 *Short-Term (Current) Lead Release Optimization Evaluation.* A lead pipe rig system will be constructed at the Flint water treatment plant with exhumed lead pipes, carefully collected and installed into the pipe rig (see example pipe rig schematic in appendix). EPA-ORD will provide technical assistance in the rig design and construction, as well as the design provisions for chemical additions. One to two people will be required to be on-site to perform periodic chemical analyses and operate and maintain the pipe rig system, as well as to troubleshoot/repair any problems and to collect samples. Laboratory

instruments for pH and colorimetric tests (chlorine residual, orthophosphate) will be needed on-site. It is anticipated that the design will include a "control" loop and loops with possibly 3-4 different dosages, in duplicate. The estimated sampling frequency would be at least three times per week, using ICP for metals and ICP-MS for lead on each sample, with one complete characterization sample before each stagnation period. Filtration apparatus will also be needed.

State or ORU lab?

5.2.2 *Simultaneous Compliance Optimization Pilot Testing Prior to Flint Water Plant Treatment of KWA Water.* This effort will necessarily be more expansive than the short-term evaluation. The same control pipes would carry over, but new pipes would need to be stabilized with the current water. Upstream of the lead pipe rig, there would need to be a series of jar tests or a small pilot plant established to optimize coagulation, softening (if necessary), filtration and disinfection processes to meet disinfection byproduct (DBP) limits and microbial inactivation requirements. Investigations are also needed to assess the potential impacts of different possible treated Lake Huron water qualities on chlorine, biofilm growth, water age, microbial pathogens such as *Legionella*, phosphate demand and scaling potential. Pilot evaluations could be done on different unit processes using anticipated Lake Huron water, using university-run pilot plants, shipped or trucked water, etc. Some pilot evaluation analyses could be done on-site with portable analytical instrumentation as is typical. When a final water quality target is determined, the target finished water would become the source water to feed into the lead (and metal) pipe rigs, and thereafter the optimization of phosphate dosing would be done on the stabilized exhumed lead pipes in the pipe rigs. A reservoir may need to be constructed to hold processed simulated Lake Huron treated water produced by the pilot plant and fed to the pipe rigs. This evaluation must be started as soon as possible to allow sufficient time for reliable results to avoid having to conduct full-scale testing on water delivered into the distribution system that could impact Flint consumers after the switch to the KWA pipeline is made.

[Note: Evaluation of Corrosion control treatment optimization using a pipe rig is a best practice for all systems changing sources/treatment.]

### 5.3 Lead Source/Release Diagnostic Evaluation

While the data collected from the pipe loops can provide information on the relative effectiveness of various treatment schemes, conditions at the plant are not the same as within the distribution system. Continued monitoring of lead levels at high risk sites throughout the distribution system is needed to make any necessary adjustments based on actual conditions within the distribution system. EPA estimates that approximately 45 homes will need to be identified for ongoing sampling to inform the treatment optimization process. (15 with lead & copper service line portions, 15 with lead & galvanized iron service lines and if available, 15 with lead and plastic service line portions). This evaluation is necessary for determining what the relative contributions of lead are from different plumbing sources in order to assure optimization of lead and other metal release from the service lines and premise plumbing. Two sampling rounds are the minimum expected for profile sampling which will utilize small volume samples through faucet and sink area and larger (one-liter) samples thereafter.

Sampling would involve 15 sites for each combination of plumbing materials (total of 45 sites), with an anticipated 10-15 sequential samples per site for metals per sampling event. Additional samples will be collected and analyzed to characterize the water quality and the sequential samples will be analyzed for Pb, Cu, Fe, Zn, and Al. An experienced plumber or researcher will be needed to map the plumbing at each site, field personnel will be needed to collect and ship samples, and a data manager will be needed to manage the data. If dissolved vs. total metals are desired in the analyses, an additional person with field filtration skills will be needed, in addition to the lab supplies. If meters, brass or galvanized pipe are found to be a significant source of lead, those devices should be included in the pipe rigs.

[Note: Monitoring of lead levels at high risk sites throughout the distribution system to make any necessary corrosion control treatment adjustments is a best practice for all systems changing sources/treatment.]

#### 5.4 Pipe analyses for long-term treatment assessment and mechanisms of lead and other metals release

Optimization of corrosion control treatment requires specialized knowledge on scale chemistry as well as specialized equipment and equipment operating skills. The timeline for activities related to evaluating the progress in optimizing corrosion control treatment following the transition to the KWA pipeline source will extend beyond the current fiscal year and likely well into FY 2017. The necessary resources and expertise must continue to be made available to the Task Force for the expected duration of the project in order to ensure a successful outcome which would enable the City of Flint to simultaneously comply with all NPDWRs following the transition to the KWA pipeline.

*This is not noted in the SLOH or LCR*

[Note: Long-term evaluation of corrosion control treatment effectiveness is a best practice for all systems.]

#### 6.0 Additional Recommendations and Needs

[Note: The additional recommendations in the Section 6.1 and 6.2 are advisable for all systems with lead service lines. The recommendation in Section 6.3 is specific to Flint.]

#### 6.1 Impact of Water Use/House Occupancy on Stability and Lead Release from Lead and Other Premise Piping.

There are a large number of unoccupied homes in Flint. Homes which have been unoccupied for an extended period of time can pose a greater risk to incoming residents due to the stagnation of water within the plumbing over an extended period of time which can destabilize the scales within the plumbing and release high lead levels into the water. If access can be facilitated by the City of Flint or other organizations involved with housing, sampling will be conducted at 10-20 vacant or recently occupied homes in conjunction with a flushing program to assess how long it takes for increased water usage to improve the effectiveness of the corrosion control treatment for these homes. Sequential sampling profiles would be done for metals as well as chlorine residuals for each home. Flushing for different times would be tested and evaluated with

repeated profile sampling to see if there is any improvement in lowering lead levels with increased water use.

#### 6.2 Protocol for Exposure Estimation Sampling for Health-Related Evaluations (Premise & Building Plumbing).

This protocol development would compare various potential options for sampling to estimate the cumulative metal exposure from the drinking water in premise plumbing or schools. Comparisons would be made with manual or automated proportional sampling, tap POU units that could log water use and be disassembled and digested for metal content, and random daytime sampling protocols. Different types of POU-suitable filtration apparatus would be tested to see if designs would permit quantitative separation of dissolved versus particulate lead and other metals. Support would be needed for setting up and operating test systems, analyzing virgin and exposed filter/device materials with accumulated metals, building and installation of proportional samplers or development of protocol for resident-collected samples, rapid turn-around Lead and other water analyses of test exposure water fed into experimental systems.

#### 6.3 Risk communication on lead service lines

Request OEJ support/assistance for the development and dissemination of risk communication material on lead service lines, including the potential risk from physical disturbances to lead service lines and lead reservoirs in other pipes downstream of lead service lines.

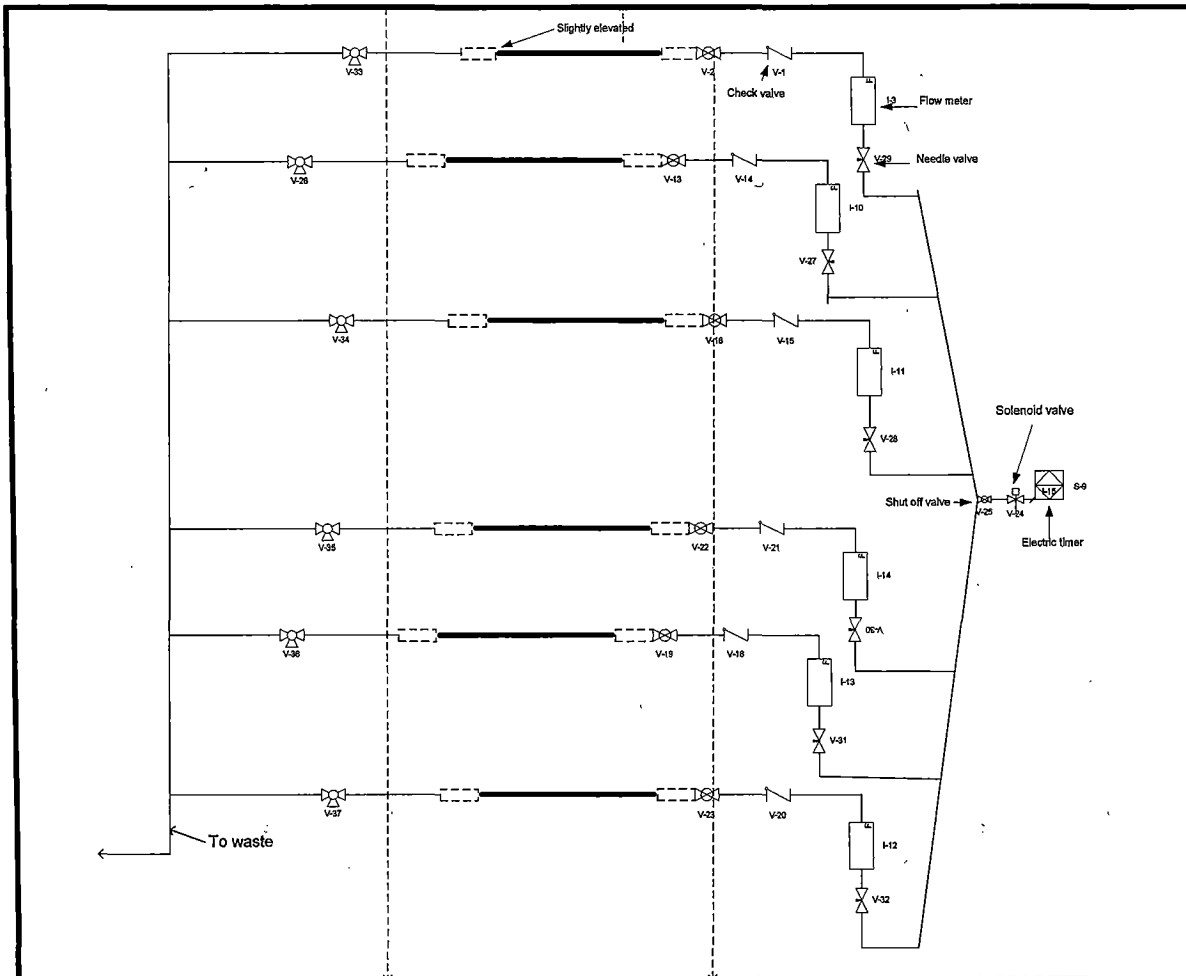
#### 7.0 Timeline

The proposed activities are contingent upon available funding. As such, it is not possible at this time to develop a meaningful timeline, with the exception of the activities in Section 2.0 and some of the activities in Section 3.0 which are discussed in those sections. Once funding is secured a detailed timeline will be developed that incorporates both funded and unfunded activities. A Task Force member will be identified as the lead person responsible for ensuring the completion of each activity or group of activities to ensure that the work is completed in accordance with the timeline.



APPENDIX

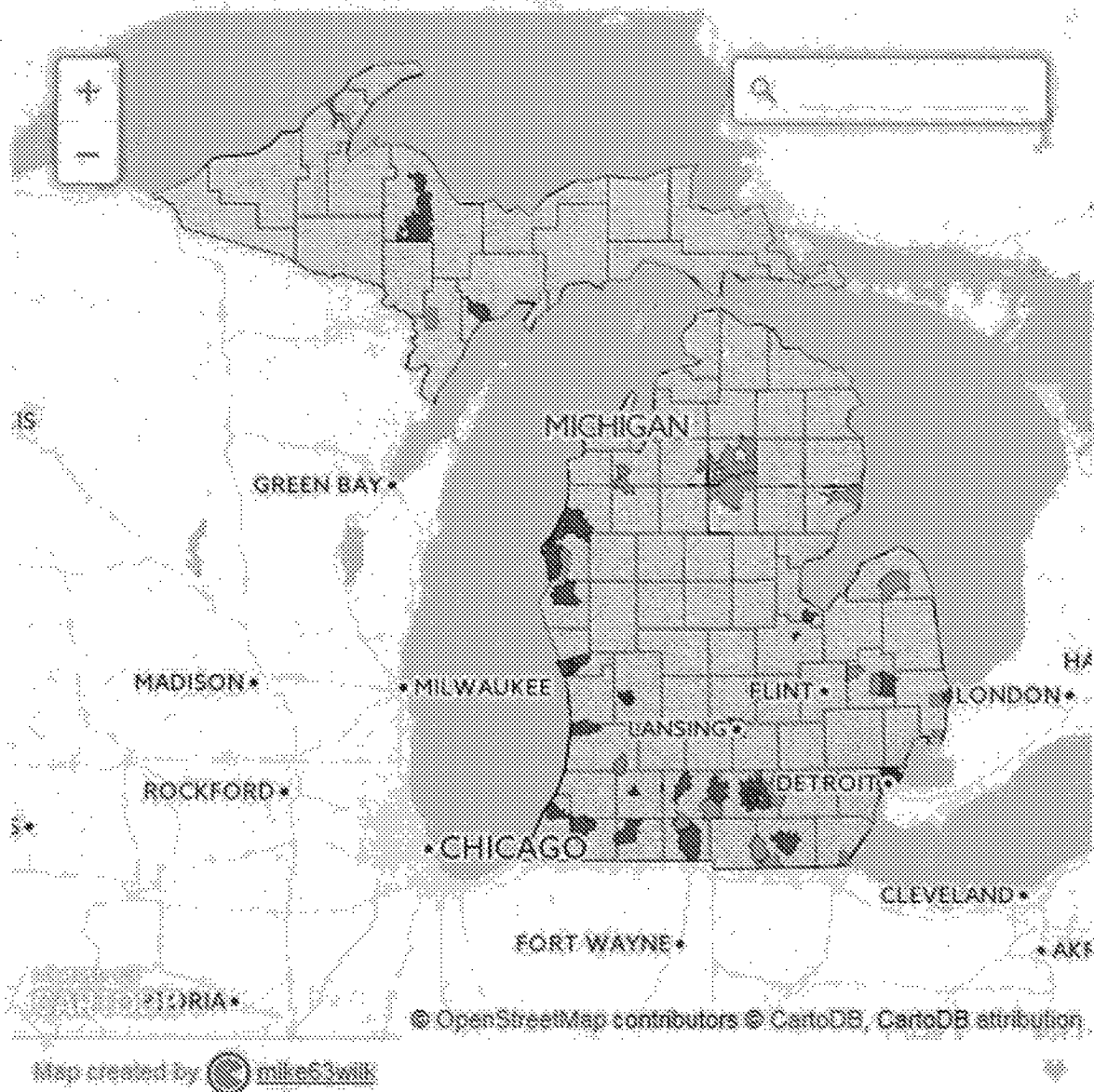
**Schematic of Lead pipe rig (6 lead sections) from single water source**



Shown above are 6 lead sections with a single water source. All are attached to a unistrut framework with casters. Water flows in a single pass through the pipes to waste. The source water can be turned off/on using a timer-controlled solenoid valve.

## Places with higher lead rates than Flint

Across Michigan, thousands of children are dealing with the effects of lead poisoning. Although much of the focus has been on lead in Flint's water supply, in many parts of the state the percentage of children with elevated levels of lead exceed rates in Flint. And the culprit is often lead paint found in older homes. **Zoom in to see how many children tested positive in your ZIP code. The areas in red are where more than 5 percent of children tested had elevated lead levels, higher than Flint. (Dark red areas had 10 or more such children; light red areas had fewer than 10 children).**



Source: Michigan Department of Health and Human Services

# Children less than Six years of age with Confirmed Elevated Blood Lead Levels (EBLL) 2012

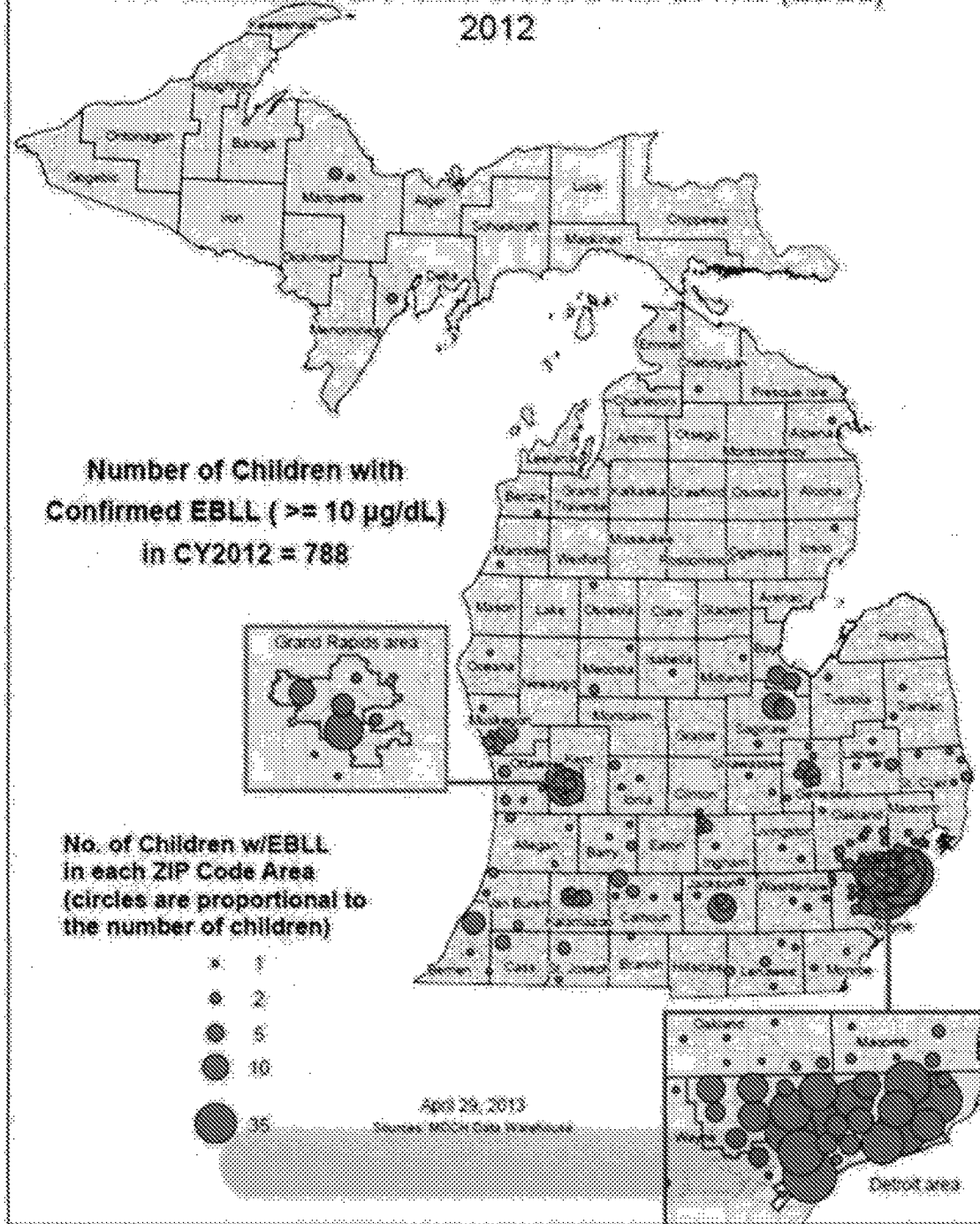
Number of Children with  
Confirmed EBLL ( $\geq 10 \mu\text{g/dL}$ )  
in CY2012 = 788

No. of Children w/EBLL  
in each ZIP Code Area  
(circles are proportional to  
the number of children)



April 29, 2013

Source: MDCH Data Warehouse





RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



DAN WYANT  
DIRECTOR

December 16, 2014

Mr. Brent Wright, Operation Supervisor  
City Of Flint - DPW  
Flint Water Plant  
4500 North Dort Highway  
Flint, MI 48505

WSSN: 02310

Dear Mr. Wright:

SUBJECT: Violation Notice – Maximum Contaminant Level for Total Trihalomethanes  
Operational Evaluation – Total Trihalomethanes  
4<sup>th</sup> Quarter 2014 Monitoring Period

The Department of Environmental Quality (DEQ), Office of Drinking Water and Municipal Assistance (ODWMA), records show that the City of Flint is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399); R 325.10610, *Maximum contaminant levels (MCL) for disinfection byproducts*, of the 1979 Administrative Code.

In accordance with R.325.10610, *MCLs for disinfection byproducts*, of the 1979 Administrative Code, the MCL for disinfection byproduct total trihalomethanes (TTHM) is 0.080 milligrams per liter (mg/L) as a Locational Running Annual Average (LRAA) at each monitoring location. As listed in the table below, our records show that the City of Flint's highest TTHM locational running annual average (LRAA), based on the last three quarters, ending November 30, 2014, is 0.099 mg/l which exceeds the standard, and that two of the eight sample site locations exceed the standard of 0.080 mg/L.

Further, in accordance with R325.107191, *Disinfection byproducts: operational evaluation levels*, of the 1979 Administrative Code, when an operational evaluation level (OEL) at a monitoring location for TTHM exceeds 0.080 mg/L, a supply shall conduct an operational evaluation and submit a written report of the evaluation to the department not later than 90 days after being notified of the analytical result that causes the supply to exceed the operational evaluation level. As listed in the table below, our records show that TTHM operational evaluation levels for the City of Flint exceed 0.080 mg/L at four of the City's eight sample site locations.

| TTHM Results (mg/L)                          |         |         |          |       |       |
|----------------------------------------------|---------|---------|----------|-------|-------|
|                                              | 5/21/14 | 8/21/14 | 11/20/14 | LRAA  | OEL   |
| DBP1 McDonalds<br>3719 Davison               | 0.162   | 0.145   | 0.059    | 0.092 | 0.106 |
| DBP2 Liquor Palace<br>3302 S. Dort Highway   | 0.112   | 0.127   | 0.033    | 0.068 | 0.076 |
| DBP3 North Flint Auto<br>6204 N. Saginaw St. | 0.097   | 0.118   | 0.041    | 0.064 | 0.074 |
| DBP4 University Market<br>2501 Flushing Road | 0.106   | 0.196   | 0.094    | 0.099 | 0.122 |
| DBP5 Taco Bell<br>3606 Corunna Road          | 0.079   | 0.181   | 0.034    | 0.074 | 0.082 |
| DBP6 Rite-Aid Pharmacy<br>5018 Clio Road     | 0.088   | 0.144   | 0.054    | 0.072 | 0.085 |
| DBP7 Salem Housing<br>3216 MLK Boulevard     | 0.082   | 0.112   | 0.050    | 0.061 | 0.074 |
| DBP8 BP Gas Station<br>822 S. Dort Highway   | 0.075   | 0.112   | 0.036    | 0.056 | 0.065 |

Our investigation consisted of a review of ODWMA files for laboratory reports received for compliance monitoring. Our investigation is considered complete. This violation began on December 1, 2014, and will continue until TTHM LRAA is below the MCL at all sample sites.

We acknowledge and appreciate the city's cooperation with our recommendation to preemptively conduct an Operational Evaluation following the City's second quarterly round of monitoring in August. That Operational Evaluation report has identified possible causes and corrective measures for the elevated TTHM levels which we encourage the City continue implementing. These modifications have likely contributed in part to the reduction in TTHM levels reported in the most recent quarter, and suggest the City may be able to achieve compliance with the TTHM standard.

Our office is continuing to review the Operational Evaluation report that was submitted on December 1, 2014, and will provide the City and their consultant comments as needed to help address this MCL violation.

Water systems that exceed the OEL must complete and submit an Operational Evaluation in accordance with Administrative Rule 719I (R325.10719I) within 90 days of being notified of the violation. **An updated Operational Evaluation report, which incorporates the most recent sample results, must now be completed and received by our office by no later than March 1, 2015.**

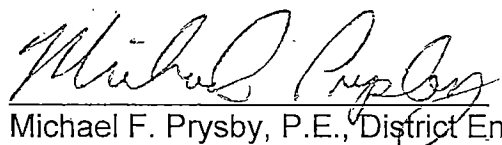
If you have any other factual information you would like us to consider regarding the violation identified in this Violation Notice (VN), please provide them in a written response by January 16, 2015.

Administrative rule R 325.10403 of Act 399 requires that suppliers provide public notice (PN) as soon as practical, but no later than thirty (30) days after the supplier learns of this type of violation, by mail or direct delivery **and** by any other means reasonably calculated to reach customers not normally reached by mail. Enclosed is a sample PN

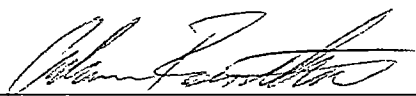
which contains the minimum required language. The City is encouraged to include additional information regarding its response to this violation. **Please notify your consumers by January 10, 2015, and send us a signed and dated copy of the notice that you issued within ten (10) days of distributing the public notice.** This violation must also be included in your 2014 Consumer Confidence Report (CCR), due by July 1, 2015. The PN must be repeated every quarter until you no longer exceed the TTHM standard. Failure to issue a PN for this violation will result in a fine of at least \$1,000 per event, with a maximum of \$5,000 per violation.

We anticipate and appreciate your continued cooperation in resolving this matter. If you have any questions regarding this VN, please contact us at the numbers below.

Sincerely,



Michael F. Prysby, P.E., District Engineer  
Lansing District Office  
Office of Drinking Water & Municipal  
Assistance  
517-290-8817



Adam Rosenthal, EQA  
Lansing District Office  
Office of Drinking Water & Municipal  
Assistance  
517-284-6644

mfp/ar/jlr  
Enclosure

cc: Mr. Darnell Early, Emergency Manager, City of Flint  
Mr. Daughtry Johnson, City of Flint  
Mr. Howard Croft, City of Flint  
Mr. Robert Bincsik, City of Flint  
Ms. Jennifer Crooks, U.S. Environmental Protection Agency, Region 5  
Genesee County Health Department  
Ms. Liane Shekter Smith, P.E., DEQ  
Mr. Richard Benzie, P.E., DEQ  
Mr. Stephen Busch, P.E., DEQ

# IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

## City of Flint Did Not Meet Treatment Requirements

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Samples were collected for total trihalomethanes (TTHM) analysis from eight locations on a quarterly basis (May 21, August 21, and November 20 of 2014). The average of the results at **ANY** of the eight locations must not exceed the maximum contaminant level (MCL) for TTHMs, otherwise our water system exceeds the Maximum Contaminant Level (MCL). The standard for TTHMs is 80 µg/L. The location reporting the highest TTHM level was 99 ug/L; thus, our water system exceeds the TTHM MCL.

### What should I do?

- There is nothing you need to do unless you have a severely compromised immune system, have an infant, or are elderly. These people may be at increased risk and should seek advice about drinking water from their health care providers.
- You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within 24 hours.

### What does this mean?

This is not an emergency. If it had been an emergency, you would have been notified within 24 hours.

*People who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer.*

### What is being done?

We are currently working on solutions to correct the problem. We anticipate resolving the problem by 2015.

For more information, please contact Mr. Brent Wright at 517-787-6537 or the Flint Water Plant at 4500 North Dort Highway, Flint, MI 48505.

*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by the City of Flint.

---

### CERTIFICATION:

WSSN: 02310

I certify that this water supply has fully complied with the public notification requirements in the Michigan Safe Drinking Water Act, 1976 PA 399, as amended, and the administrative rules.

---

Signature

Title

Date Distributed

Reminder to water supplier: This notice / certification must be sent to the DEQ.

- Current Issue → Cpy of MCL to Flt Rep/Sen.

- TTHM November



- OEL Analysis

- EM Briefing

MLg

↳ Regroup Comm Approach



# City of Flint Water Plant DBP

## Distribution System Sampling Site Locations

| Site ID #                                 | Routine Site Name & Address                                             | Up-Stream Site Name & Address                                    | Down-Stream Site Name & Address                                    |
|-------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------|
| DBP #1<br>(previously DBP 1)              | <u>McDonalds Restaurant</u><br>3719 Davison Rd.<br>Flint, MI 48506      | Arby's Restaurant<br>3742 Davison Rd.<br>Flint MI 48506          | Admiral Gas Station<br>3802 Davison Rd.<br>Flint, MI 48506         |
| DBP #2 <sup>3</sup>                       | <u>BP Gas Station</u><br>822 S. Dort Hwy.<br>Flint, MI 48503            | Advasure Insurance<br>810 S. Dort Hwy.<br>Flint, MI 48507        | Rite-Aid Pharmacy<br>2838 E. Court St.<br>Flint, MI 48506          |
| DBP #3 <sup>2</sup><br>(previously DBP 2) | <u>Liquor Palace</u><br>3302 S. Dort Hwy.<br>Flint, MI 48507            | Mattress Savers<br>3124 S. Dort Hwy.<br>Flint, MI 48507          | Premier Insurance<br>3316 S. Dort Hwy.<br>Flint, MI 48507          |
| DBP #4 <sup>5</sup>                       | <u>Taco Bell</u><br>3606 Corunna Rd.<br>Flint, MI 48532                 | Rite Aid Pharmacy<br>3521 Corunna Rd.<br>Flint, MI 48532         | McFalls Collision<br>3614 Corunna Rd.<br>Flint, MI. 48532          |
| DBP #5 <sup>4</sup><br>(previously DBP 4) | <u>University Market</u><br>2501 Flushing Rd.<br>Flint, MI. 48504       | Consumer Services<br>2702 Flushing Rd.<br>Flint, MI. 48504       | Rube's Bar<br>1117 N. Chevrolet Ave.<br>Flint, MI. 48504           |
| DBP #6 <sup>7</sup>                       | <u>Salem Housing</u><br>3216 M. L. King Blvd.<br>Flint, MI 48505        | BP Gas Station<br>3317 M.L. King Blvd.<br>Flint, MI. 48505       | Hinky Dinky Market<br>3110 M.L. King Blvd.<br>Flint, MI. 48505     |
| DBP #7 <sup>6</sup>                       | <u>Rite-Aid Pharmacy</u><br>5018 Clio Rd.<br>Flint, MI 48504            | Urban League of Flint<br>5005 Cloverlawn Dr.<br>Flint, MI. 48504 | Clio Coin Laundry<br>4930 Clio Rd.<br>Flint, MI. 48504             |
| DBP #8 <sup>3</sup><br>(previously DBP 3) | <u>North Flint Automotive</u><br>6204 N. Saginaw St.<br>Flint, MI 48505 | Al & Jerry's Mini-mart<br>6101 N. Saginaw St.<br>Flint, MI 48505 | Hutchinson's Food & Drug<br>6509 N. Saginaw St.<br>Flint, MI 48505 |

### DBP Sampling Frequency – 8 samples quarterly

- Routine samples are collected during the 3<sup>rd</sup> full week of February, May, August, & November.
- Prior to April 2014, four (4) samples were required under EPA Stage 2 DBP. Those sites are included in our current 8 samples, and are changes in site codes are indicated in red.
- Due to initial high levels of TTHM after full time operation in April, extra samples have been collected from our Cedar St. & West Side pump stations/reservoirs, to help us determine beneficial operational procedures.

**Prysby, Mike (DEQ)**

---

**From:** Michael Glasgow <mglasgow@cityofflint.com>  
**Sent:** Wednesday, December 10, 2014 12:42 PM  
**To:** Prysby, Mike (DEQ)  
**Subject:** Re: Stage 2 DBP Monitoring Plan  
**Attachments:** Nov 2014 MOR Scan.pdf; DBP Distribution System Sampling Site Locations.docx

Mike,

Good afternoon. I don't believe we sent a formal copy of our DBP monitoring plan to reflect the change for full time operation. Prior to April 2014, the Stage 2 DBP monitoring sites were: DBP 1 - 3719 Davison Rd, DBP 2 - 3302 S. Dort Hwy., DBP 3 - 6204 N. Saginaw St., DBP 4 - 2501 Flushing Rd. After April, our monitoring schedule showed that we had to collect 8 DBP samples quarterly. With only 8 distribution sites (disregarding the reservoirs) we use every site in Bacteriological Sample Site Plan. Site #1 is now DBP 1, Site #2 is now DBP 2, and so on. We continued on the same sample time schedule as before April: The 3rd full week of February, May, August, & November. I have attached a copy of the "rough" DBP sample monitoring plan.

I have also attached a copy of the November 2014 MOR, a hard copy will be sent out today.

On Tue, Dec 9, 2014 at 11:15 AM, Prysby, Mike (DEQ) <[PRYSBYM@michigan.gov](mailto:PRYSBYM@michigan.gov)> wrote:

Brent, Michael

Can you e-mail us a copy of Flint's most recent Stage 2 DDBP monitoring plan (updated plan to reflect full-time operation of the WTP – after April 25<sup>th</sup>)? We need to confirm site codes for the various TTHM/HAA5 sampling locations. Thanks...

Michael Prysby, P.E.

District Engineer

Office of Drinking Water and Municipal Assistance

517 290-8817

*Bush Comments*

DRAFT COPY

**PRELIMINARY DESIGN BASIS REPORT FOR THE  
GENESEE COUNTY WATER TREATMENT PLANT**

**FOR**

**GENESEE COUNTY DRAIN COMMISSIONER  
LAKE HURON WATER INITIATIVE**

**April 2014**

**AECOM / WADE TRIM  
Flint, Michigan**

Jeffrey Wright



Genesee County Drain Commissioner

Program Management by:

 WADE TRIM

**AECOM**

**LAKE HURON WATER INITIATIVE  
PRELIMINARY DESIGN REPORT FOR  
GENESEE COUNTY WATER TREATMENT PLANT**

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## SECTION 1 - OVERVIEW

The Genesee County Water Treatment Plant (WTP) will be a conventional (flocculation/sedimentation/filtration) type of plant that will treat raw water from Lake Huron. The location for the plant will be at the northeast corner of the Stanley Road and Marathon Road intersection, and a preliminary site plan is shown in Figure 1. This report is a summary of design criteria that can be determined at this time for the water treatment unit processes and ancillary facilities. All design criteria are in accordance with or exceed the Ten States Standards, Michigan Department of Environmental Quality and the Environmental Protection Agency.

Based on previously determined water demand projections, the plant is to be designed with an initial conceptual capacity of 30 mgd. However, all plant piping and conduits will be designed for possible expansion to 45 mgd in the future. The 30 mgd plant is planned to have two 15 mgd treatment trains, and if one of the 15 mgd treatment trains is down for maintenance and/or repairs, the time the train is out of service will need to be planned ahead to limit the amount of down time. During down time of one 15 mgd treatment train, the Genesee County system can run off of downstream finished water storage and the output of the remaining 15 mgd treatment train for a limited timeframe.

The water treatment plant and auxiliary facilities at the treatment plant will include the following unit processes:

- ✓ 1. Raw water receiving reservoir *size?*
- ✓ 2. Raw water pump station
- ✓ 3. Chemical mixing
- ✓ 4. Flocculation
- ✓ 5. Clarification/sedimentation
- ✓ 6. Gravity filtration
- ✓ 7. Chemical storage and feed
- ✓ 8. Disinfection and fluoridation
- ✓ 9. Finished water storage
- ✓ 10. Finished water pumping
- ✓ 11. Waste reclamation and disposal

The preliminary process flow diagram for the facility is shown in Figure 2, and the preliminary hydraulic profile for the plant processes is shown in Figure 3. In addition, the preliminary plant layout is shown in Figure 4. Descriptions of the major facilities to be provided as listed are as follows.

## SECTION 2 - RAW WATER RECEIVING RESERVOIR

A receiving reservoir will be provided at the WTP to provide sufficient volume of raw water for the water treatment plant, which is located approximately 50 miles from the Lake Huron intake. The raw water will enter the east side of the WTP site through a 60-inch diameter water transmission main with a pressure sustaining valve to maintain upstream pressures. The City of Flint will also be withdrawing raw water from the receiving reservoir and it is possible that the City of Lapeer will be withdrawing raw water as well. This initial receiving reservoir is expected to have a storage volume of 150 MG, be open to atmosphere and be lined along bottom and

10 days  
@ 15 MG D Avg

sides with a geo-membrane liner. The following is a summary of days of reservoir storage available for various raw water withdrawal scenarios:

|                         |          |
|-------------------------|----------|
| 20 mgd withdrawal rate: | 7.5 days |
| 30 mgd withdrawal rate: | 5.0 days |
| 40 mgd withdrawal rate: | 3.8 days |
| 50 mgd withdrawal rate: | 3.0 days |
| 60 mgd withdrawal rate: | 2.5 days |

What is Future  
Avg. Day (50yr)?

Raw water from the receiving reservoir will be delivered to the water treatment plant via raw water pumps. These pumps are expected to be high capacity, low head pumps that provide the necessary raw water flow to the beginning of the plant process, which are discussed in greater detail below in Section 3.

### SECTION 3 – RAW WATER PUMP STATION

#### 3.1 Raw Water Pumps

The cities of Flint and Lapeer are expected to be withdrawing raw water from the receiving reservoir, with 18 mgd and 4 mgd water demands respectively, each with dedicated pumps. Flint's existing water treatment plant will either treat raw Lake Huron water or river water in an emergency. Lapeer would need to add reservoir storage at their plant, as needed, for their desired reliability of finished water. This pump station will be located on the same site as the Genesee County Water Treatment Plant, and will be housed within a combined facility with the WTP raw water pumps. The cost to construct the raw water pump stations for Lapeer and Flint need to be tracked separately since they are raw water and are not the responsibility of GCDC-WWS. There will be three sets of raw water pumps at the Genesee County Water Treatment Plant site as follows:

1) Supply to Genesee County Water Treatment Plant

Initial: Five pumps at 7.5-mgd (four duty and one standby)  
Future: Two additional pumps at 7.5-mgd

All pumps will have a total dynamic head of approximately 20-ft.

2) Supply to City of Flint

Initial: Four pumps at 3.0-mgd (three duty and one standby)  
Future: Replace the four above pumps with 6.0-mgd pumps

All pumps will have a total dynamic head of approximately 200 to 250-ft.

3) Supply to Lapeer (this may never be constructed initially or ever depending on Lapeer's decision to buy treated water)

Initial: Three pumps at 2.0-mgd (two duty and one standby). Depending on who purchases water in the future, these pumps may be larger so provisions should be made for possible larger pumps.  
Future: Unknown

Any Initial install of piping or pads, etc?



All pumps will have a total dynamic head of approximately 200 to 250-feet.

All three sets of pumps will draw raw water from the on-site 150 million gallon water storage reservoir. Space is available on-site for construction of a second reservoir in the future. The water level in the storage reservoir will normally vary over a relatively narrow operating range, with a normal high water surface elevation of 837.0. However, the water level could be drawn down if there are interruptions in water supply to the reservoir. The water level could be drawn down to a minimum water surface elevation of 810.0. The three sets of pump must have the capability of discharging their rated capacity when the reservoir is drawn down to the minimum level.

Flow to the adjoining Genesee County water treatment plant will normally be by gravity when the storage reservoir is operating at its upper range of level. However, when the storage reservoir is drawn down, gravity flow will not be possible. Consequently, the pumps (item 1 above) feeding the adjoining plant will not normally operate, and will have low pumping head when they do operate.

### 3.2 Screens

Water supply to the on-site reservoir will have been screened at a facility located adjacent to Lake Huron. However, because of the fact that the 150 MG reservoir will be an open reservoir, there is the possibility of fish, amphibians, and other organisms taking up residence in the reservoir. Therefore, screens will be provided to exclude fish, inorganic debris, and other organisms from the flow withdrawn from the reservoir by the raw water pumps. Submerged passive intake screens of the type manufactured by Johnson Screens are recommended for simplicity and low cost. A compressed air cleaning system will be provided to periodically clean the submerged screens.

Based on preliminary sizing, two 60 inch diameter tee-style screens will be required for a design capacity of 65-MGD for each reservoir. The submerged screens will be supported on a foundation constructed at the bottom of the reservoir. An intake pipe will extend from the screen to a junction chamber adjacent to the reservoir. The size of the intake pipe is 72-inches based on preliminary sizing. The junction chamber will include a capped intake pipe for screened flow from the second future reservoir. The chamber will be designed to isolate flow from the two intakes so that either intake may be taken out of service while the other remains operational.

### 3.3 Pump Station Design

The three sets of raw water pumps will be housed in a common structure adjacent to the raw water reservoir. Two pipes will be extended from a common chamber in the junction chamber to the lower level of the pump station building in a side-by-side configuration. The two pipes will serve as suction headers for the pumps. The two pipes will be connected to each other within the building to form a continuous loop, with knife gate valves to isolate sections of the header pipes for future maintenance. The looped header also allows flow to be fed to the pumps from two directions. Based on preliminary sizing, the suction headers will be 54 inches in diameter. The header pipes inside the station will be either steel or ductile iron.

The pump station will provide space for fourteen (14) pumps total. The seven low head pumps (five initial and space for two future units) for water supply to the adjoining Genesee County water treatment plant will be arranged in a line on one side of one of the suction headers. The seven pumps for Lapeer and City of Flint (the other two sets of pumps) will be lined up in a mirror image on the opposite side of the second suction header.

Can-style vertical pumps will be used to achieve a compact pump station design. The suction headers and pump intake piping will be located in a piping gallery below the main floor level. The pump discharge piping and vertical pump motors will be located on the main floor level. The depth of the piping gallery will be governed by the low water level in the 150 MG reservoir, by the number of stages required for the vertical pumps, and by the submergence requirements for the pumps. Communications with pump manufacturers will be required to determine the number of pump stages and pump submergence requirements. The 250-ft total dynamic head pumps may require three to six stages. The low head pumps for water supply to the adjoining water treatment plant will most likely be single stage mixed flow pumps rather than turbine pumps.

A preliminary layout for the proposed pump station and junction chamber is shown on Figures 5, 6 and 7.

### 3.4 Valves

Valves will be provided to isolate the suction headers from the water intake junction chamber, and to isolate segments of the looped suction header. Valves will also be provided to isolate the pump discharge headers from downstream yard piping or transmission mains. These isolation valves will be either gate valves or butterfly valves. Both will be evaluated during the detailed design. Valves will be provided at each pump to isolate the pump from the suction and discharge headers. The valves could be butterfly valves or gate valves. Both will be evaluated during the detailed design. For cost economy, all isolation valves will be equipped with manual actuators.

Each pump will be equipped with a combination check valve, surge control valve. Three different types of valves will be considered during detailed design:

- Hydraulically actuated cone valves;
- Hydraulically actuated ball valve;
- Motor actuated check valve, e.g. Checktronic, as manufactured by GA Industries.

### 3.5 Equipment Maintenance

It will be necessary to periodically remove a pump or its motor for maintenance. It is anticipated that maintenance requiring equipment removal will occur infrequently, and that the equipment would be removed from the pump station for maintenance by an outside company specializing in the type of maintenance required. An overhead bridge crane would make it easy to install or remove equipment. However, a bridge crane would require a higher ceiling and would add to the construction cost of the pump station. An alternative is to provide covered openings in the roof above each pump, with provision for removal of a pump and motor using a mobile crane. For cost economy, this latter option will be the basis for detailed design of the facility.

### 3.6 Structural, Architectural and Mechanical Design

The below-grade portion of the pump station and the intake junction chamber will be designed to be constructed of reinforced concrete. The above-grade portion of the pump station will be designed to be framed using structural steel.

Exterior walls of the pump station will be designed to be constructed of insulated precast concrete panels. Interior walls will be constructed using concrete masonry units.

The proposed pump station will be designed to be ventilated using a combination of supply and exhaust fans. Heating will be provided using electric, or natural gas-fired if available, unit heaters.

Building plumbing systems will include floor and roof drains, and sump pumps in the basement (lower piping gallery). A janitor's closet and a unisex toilet will also be provided.

### 3.7 Electrical

Electrical power will be brought to the site at 120 kV and it will be stepped down at the substation to 4.16 kV. An outdoor electrical transformer will be provided to step down power to 480 volts, at which voltage all of the pump motors will operate.

All pumps will be equipped with open drip proof high efficiency induction motors installed in a vertical configuration. One of the Flint pump motors will also be inverter duty rated for use with a variable frequency drive to allow for their operators to dial-up and dial-down their raw water flows. Based on preliminary selection, the motor sizes will be:

- |                                                     |                |
|-----------------------------------------------------|----------------|
| • Genesee County WTP (7.5 MGD pumps at 20-ft TDH):  | 40 horsepower  |
| • Supply to City of Flint (3.0 MGD at 250-ft TDH):  | 200 horsepower |
| • Supply to City of Lapeer (2.0 MGD at 250-ft TDH): | 150 horsepower |

Space will be provided in the pump station for one (1) variable frequency drive to for one of the Flint pumps.

*Space for Future VFD's?*

## SECTION 4 – PROCESS BUILDING

The new process building will be situated to the east of Marathon Road and north of Stanley Road. The building foundation will be of reinforced concrete construction. The superstructure of the process area that houses the flocculation basins, sedimentation basins and filters is expected to be constructed with steel or reinforced concrete beams and columns. The exterior walls will be constructed of one of the following:

- Brick-face cavity wall (face brick and concrete masonry backup)
- Precast concrete panels with brick veneer
- Combination brick-face / metal panel cavity wall with concrete masonry backup

The roof will be constructed with flat concrete hollow core roof panels, which will provide increased resistance to corrosive conditions. The roof covering will be an insulated single-ply membrane roofing system.

The main building area that houses the chemical feed and storage rooms, electrical and mechanical rooms, offices, laboratories, and high service pump rooms will consist of two floors, as shown in Figure 4, and constructed with steel or reinforced concrete beams and columns. The exterior walls will be constructed of either brick-face cavity wall (face brick and concrete masonry backup) or precast concrete panels with brick veneer. The roof will be constructed of a pitched, standing seam metal roofing system over this entire area, a flat, precast concrete hollow core panel roof may be used over the entire area with an elevated pitched roof raised above the adjacent roof at the entry in order to identify and highlight the building entry. The exterior detailing and massing of the building will be designed to mimic the local "farm building" vernacular.

The main access drive, parking and entrance will be from the south side of the building off Stanley Road and a loading dock will be located along the east side of the building (See Figures 1 and 4). A service drive will be provided off Marathon Road for accessing the substation. Access into the plant will be by at-grade entrances, which will provide access to the first floor level of the plant. The second floor will be accessed by either elevator or stairwell, and it is anticipated that there will be windows along the west wall of the second floor overlooking the pump room below. The substructure can be bermed utilizing earth, which will be excavated for the construction of the new backwash ponds and the receiving reservoir, but will depend on geotechnical findings and recommendations. The addition of a separate vehicle storage garage may be considered during design but is not included in the preliminary layouts at this time.

Space will be provided to allow for expansion of the water treatment plant processes to an additional 15 mgd, or an expansion of 50 percent of the proposed process facilities. If pre-cast concrete panel construction is utilized, this building expansion may be made easier if all the wall panels will be removed on the north side for the future expansion. Alternatively, the walls on the north end can be maintained in part or in their entirety at the future expansion with an opening only at the center walkway to minimize demolition removal costs in the future. The loading dock will be located on the east side of the building. The chemical rooms have been arranged near the loading dock so that the hauling of chemicals is minimal.

*electrical Equip away from chems*  
The maintenance and parts storage areas will be located on the grade floor level with ready access to the chemical feed equipment and to the filter area. The chlorination storage and feed rooms will have direct exterior exits, with a combination eye wash safety shower located along the path of egress. The chemical storage and feed areas will also be located on the grade floor. The grade floor will have access to the high service pump area, which will be set over a wet well adjacent to the finished water reservoir and the height of the pump room is expected to match the height of the two-story main building area. The second floor level is divided into areas, with conference rooms, offices and a mechanical room to the west, and a lunch room, laboratory and storage room to the east.

Architectural considerations for the various areas are as follows:

- The flocculation/sedimentation basin and filter areas shall be enclosed within glass/aluminum storefront windows to provide control of humidity and temperature in the remainder areas of the building
- All fixtures, light switch plates, etc., and all conduits in the filter area shall be PVC coated rigid galvanized steel for corrosion control. In addition, all ductwork shall be constructed of corrosion resistant materials.

- The chemical storage and feed rooms will have hardened concrete floors and concrete containment area walls for all liquid chemical storage areas. A common chemical storage/feed area will be provided for compatible chemicals. Rooms separated by concrete block partitions will be provided for the chlorine storage and feed rooms.
- Sound attenuation alternatives in the blower and high service pump rooms will be assessed during design.

The walls will be painted concrete block. The lunch room will be sized to accommodate a small refrigerator, microwave oven, base and wall cabinets with a single bowl stainless steel sink, dishwasher and garbage disposal facilities. The lunch room will have the capability to be partitioned such that a section can be used as a training room. The floors will be covered with vinyl tile and there will be an acoustical suspended ceiling. The storage rooms will provide areas for office supplies and files such as record drawings and shop drawings. The locker, shower and toilet room facilities will be provided for both men and women. Toilet rooms will be designed to satisfy ADA requirements.

The laboratory will be divided into separate areas for wet chemistry and microbiological labs. Storage space will be provided for lab supplies. In addition, there will be a small operator's laboratory on the first floor near the filters. The drawings and specifications will include all cabinetry, plumbing, gas (propane tank if natural gas not available) and electrical utilities. The walls will be painted concrete block, the floors will be covered with chemical resistant flooring and there will be an acoustical fiberglass faced suspended ceiling.

The mechanical room will provide heating and ventilation for the building. Air conditioning for the offices, lunch room, training room, toilets and locker rooms will also be provided. The laboratory will have a stand-alone air conditioning unit to provide dedicated control of heat, cooling and humidity.

There is an empty area between the filters and reservoir where a future solids handling building could be located, as could other processes such as ultraviolet disinfection.

## SECTION 5 - CHEMICAL MIXING

The chemical mixing facilities will consist of four (4) chemical feed and meter vaults, one for each of the treatment trains, where chemicals will be injected into the raw water pipelines and paced on the metered flow. Downstream of each chemical feed and meter vault will be buried in-line static mixers that will provide the necessary rapid mixing prior to each raw water pipeline entering the flocculation basins. The static in-line mixers will be based on a Sulzer Chemtech (formerly Koch) type of design. See Figure 4 for the preliminary layout of the raw water piping and rapid mix facilities.

## SECTION 6 - FLOCCULATION

The flocculation facilities will consist of four (4) reinforced concrete basins within the Process Building, each 35 feet wide, 3 stages each 13.33 feet long, and an average water depth of 15 feet. In addition, it is anticipated that a 3 feet wide inlet channel and 3 feet wide outlet channel will be constructed at each end of the basins resulting in an overall length of 46 feet. This sizing will provide a detention period of 30 minutes and a flow-through velocity of 1.33 feet per minute (fpm), which is less than the Ten States Standards recommendation of not to exceed 1.5 fpm.

@ X MED?

Fluo Thru Vel. April 2014  
@ Min. Flows Percol Flow  
Basin Settling



Each basin will be sized for a 7.5 mgd capacity, or 30 mgd total capacity. Two additional 7.5 mgd basins can be installed in the future to meet the ultimate 45 mgd plant capacity.

*staggered*

The basins will be equipped with vertical shaft type flocculators (design will be based on Philadelphia Mixing Solutions flocculator drives and impellers), inside each of the 3 stages (35 feet wide by 13.33 feet long), and baffle walls will be located between the stages to minimize short circuiting. These baffles will need to be designed such that the pass-through velocities do not exceed 1.5 ft/s. The flocculators shall be driven by variable speed drives with the peripheral speed of impeller blades ranging from 0.5 to 3.0 fps.

|                          |                                                          |
|--------------------------|----------------------------------------------------------|
| Type:                    | Reinforced concrete basins with vertical shaft mixers    |
| Quantity:                | 4                                                        |
| Capacity per basin:      | 7.5 mgd                                                  |
| Detention time:          | 30 min.                                                  |
| Mixing volume per basin: | 156,250 gal.                                             |
| Stages per basin:        | 3 - 13.33 feet long each                                 |
| Size (each):             | 35 feet wide by 40 feet long by 15 feet floc water depth |

*Why not Flocc to Sed*

It is expected that the 24-inch diameter treated water pipelines located downstream of the chemical feed/meter vaults and in-line static mixers will feed each of the flocculation basins. The typical recommended velocity for transporting chemically treated water is 1 to 4 fps. The treated water will then pass around baffles inside the flocculation basins to minimize short circuiting.

## SECTION 7 - CLARIFICATION/SEDIMENTATION

The clarification/sedimentation facilities will consist of four (4) reinforced concrete settling basins within the Process Building with the same widths as the flocculation basins (35 feet) and inclined plate settlers installed within to improve the efficiency of the settling process. The plate settlers will be vertically inclined to allow solids to slide down the inclined surface and drop into the basin below. Distances between plates are designed to provide an upflow velocity lower than the settling velocity of the particles, allowing particles to settle to the plate surface. These distances between plates are typically 2 to 4-inches. Plate loading rates typically range from 0.3 to 0.7 gpm/ft<sup>2</sup> and Ten State Standards recommends a maximum plate loading rate of 0.5 gpm/ft<sup>2</sup> per square foot, based on 80 percent of the projected horizontal plate area.

*Not recommended to D&W*

It should be noted that plate sizing, plate angle, plates per pack, plate rows across the width of the basin and number of packs per row will vary by manufacturer. For this analysis we have contacted Parkson Corporation, a prominent provider of these systems, and they have provided a recommended inclined plate settler arrangement based on the design conditions. In addition, Parkson indicated that their recommended arrangement is based on their technology's ability to achieve 100 percent effective plate clarification, as compared to Ten State Standards recommendation of plate loading rates based on 80 percent effectiveness. As a result, a lower plate loading rate of 0.4 gpm/ft<sup>2</sup> was used as design criteria to adjust to Ten State Standards.

It is our understanding that there are concerns with ferric accumulating on the plate settlers over time. While Parkson does not offer the capability for plates to be pulled out and cleaned, they do offer a side-orifice style of design where a flume is installed that provides access to the side

of the plates. We will be looking at this type of design in order to allow for easier maintenance of the plate settlers.

✓ Outlet weirs and troughs will be provided between the inclined plates. The rate of flow over the outlet weirs will be maintained at or under 20,000 gpd per foot of weir length.

#### General

Type: Reinforced concrete basins with inclined plate settlers  
Quantity: 4  
Capacity per basin: 7.5 mgd  
Plate loading rate: 0.4 gpm per square foot *8' x 8' = 64*  
Effective plate clarification: 100 percent (per Parkson)  
Rate of flow over outlet weir: Not to exceed 20,000 gpd/ft of outlet launder

#### Inclined Plates

Inclined angle: 55 degrees  
Collection area per basin: 22,700 square feet  
Size: 5 feet wide by 10 feet long  
Number required: 450  
Rows along width: 5  
Plate packs per row: 2  
Space in front of packs: 10 feet

#### Basin Size

Dimensions: 35 feet wide by 40 feet length by 15 feet water depth  
Volume: 157,080 gallons

Mechanical sludge collectors scrapers and cross collectors, similar to Envirex/Siemens flight and chain type sludge collector systems, will be provided for sludge removal in each basin. The settled solids will be transported by the collectors to a sludge slump for periodic withdrawal. The sludge will be disposed of by pumping to the backwash ponds located on the site in which the supernatant will be decanted and pumped to the raw water pump station wet well.

#### Solids Collection System

Type: Chain-and-flight type collector  
Longitudinal scrapers: 2  
Cross collectors: 1  
Sludge disposal: Pumped to backwash ponds

Two additional 7.5 mgd sedimentation basins can be installed in the future to meet the ultimate 45 mgd plant capacity.

✓ According to Ten State Standards, the maximum velocity of treated water in pipe and conduits to filters is 2 fps. Assuming two clarified water pipes will be provided, 1 for each set of 2 sedimentation basins, the size of these pipes will be 48-inch diameter. If two additional 7.5 mgd sedimentation basins are constructed in the future, then they would also have a 48-inch diameter clarified water connecting pipe to the filters. These clarified water pipes will be interconnected in order to balance flows and to allow for flexibility in case one needs to be taken out of service.

## SECTION 8 – GRAVITY FILTRATION

A total of eight (8) reinforced concrete variable head constant rate filters in two sets of four will be provided within the Process Building. Each filter will have a rated capacity of approximately 3.75 mgd at a loading rate of 3 gpm/sf. According to Ten States Standards, typical filtration rates are 2 to 4 gpm/sf. Once the gravity filtration facilities are fully operational, the permissible loading rate could be increased to up to 5.0 gpm/sf if continuous monitoring and recording equipment for turbidity is provided for each filter and surface wash is provided. Filter piping and conduits will be designed for a 5 gpm/sf maximum filtration rate.

Not  
State  
Paper  
It should be noted that per the Michigan Safe Drinking Water Act, if 4 or more filters are provided, the total rated capacity of the filters does not need to incorporate the largest filter being removed from service. As a result, the total filter capacity will be less when filters are offline for backwashing. However, it is anticipated that a loading rate higher than 3 gpm/sf will be approved by MDEQ once operational, so this will likely offset reduced overall filtration capacities during backwash.

Each filter will have 868 square feet of surface area, which can be achieved with dimensions of 30 feet by 30 feet, or 25 feet by 35 feet, and actual sizing will be determined during design. The maximum total filter capacities based on various loading rates are shown in Table 1 below:

**Table 1  
Potential Filtration Rates**

| Loading Rate, gpm/sf | Capacities, mgd |
|----------------------|-----------------|
| 2.0                  | 20              |
| 3.0                  | 30              |
| 4.0                  | 40              |
| 4.5                  | 45              |
| 5.0                  | 50              |

The filter media will be dual media consisting of 12-inch thick layer of silica sand beneath an 18-inch thick layer of anthracite. Per the Ten State Standards, the effective size of the anthracite will be 0.8 to 1.2 mm with a uniformity coefficient not greater than 1.7, while the sand will have an effective size of 0.45 to 0.55 mm with a uniformity coefficient not greater than 1.65.

2 The filters will be of the multi-wash, central control column, flow-splitting type with two sets of four (4) filter cells each. These filters will be designed based on the CENTROL Cluster Gravity Filter system by WesTech, formerly General Filter. The central column shall be upsized to 10-foot diameter, a larger than standard size, to allow for easier maintenance and operation. Water depth in the filters during normal filtration procedures will be approximately 9 feet and will be controlled by the raw water flow rate. Each filter cell will be equipped with washwater troughs, with each trough draining to the center wash water gullet. According to Ten State Standards, the washwater troughs should be constructed such that the bottom elevation is above the maximum level of expanded media during washing, a 2-inch freeboard should be provided at the maximum rate of wash, and spacing of each trough should be such that each serves the same number of square feet of filter area.



The filters will be designed for simultaneous air/water backwash of the filter media. The filters will be furnished with a stainless steel central control column, and an underdrain designed specifically for simultaneous air and water backwash. Each filter's air supply isolation valves for the individual filter air backwash will be located within the central control column for easier maintenance in lieu of inside each filter, which is typically the case. Additionally, each filter cell will be valved to provide complete isolation.

According to Ten State Standards, a minimum rate of 15 gpm/sf is required for backwashing, and a rate of 20 gpm/sf is recommended to provide a 50 percent expansion of the filter bed. In addition, the filter backwash operation needs to be at least 15 minutes for one filter at the design rate of wash. The underdrain system will be a parallel lateral system that utilizes water and air during backwashing. This underdrain will be a low-profile type that maximizes the available space above to accommodate deeper filter media beds in response to potentially more stringent future treatment regulations. The underdrain system shall be designed to incorporate air scour at a normal operating rate of 4 scfm of air per square foot. According to Ten State Standards, air flow for scouring the filter must be 3 to 5 scfm/sf when air is introduced in the underdrain. Therefore, the blowers shall be designed for 5 scfm/sf in order to provide operational flexibility, and the required capacity of the air blower should be 4,340 cfm. Per Ten State Standards, when air scour is provided the backwash water rate must be variable and should not exceed 8 gpm/sf unless operating experience shows that a higher rate is necessary to remove scoured particles.

multi filter BW?

The filters, wash troughs, piping, etc. will be sized for a maximum backflow rate of 20 gpm/sf of filter area with one cell backwashed at a time. Backwash water will be derived from the filter effluent from the filters in service. The effluent channels of the filters will be a common channel to allow maximum availability of water for backwashing. A supplemental backwash supply line from the high service pump discharge header to provide additional backwash water capabilities will be investigated during design.

General

Type: Multi-wash, central control column, flow-splitting configuration  
Number of filters: 8 filters  
Filtration rate: 3.0 gpm/sf  
Capacity per filter: 3.75 mgd  
Total filter capacity: 30 mgd  
Central Column Size: 10-foot diameter  
Underdrain: Parallel, lateral type, air and water

Basin Size

Dimensions: 30 feet wide by 30 feet length by 15 feet water depth  
Surface area per filter: 868 square feet

Media Depth

Sand: 12-inches  
Anthracite: 18-inches  
Future deep bed depth: 75-inches total

Backwash

Type: Combination air and water  
Air scour blowers (2): 4,340 cfm each  
Backwash water: Filter effluent from other in-service filters with supplemental line from high service pump discharge header

*Handwritten: Litter/ Tackles controls*

Backwashing of the filters will be operator initiated from a control console located either over the central control column or alternatively outside the filter room area to avoid the abrasive conditions, or remotely from the control room via the SCADA system. The control console will operate each set of four (4) filters through the use of pneumatically controlled butterfly valves. The blowers will be located in a separate room, which will be constructed of grout filled concrete block in order to assist with noise attenuation. This room will be located near the filters for easier maintenance access.

As previously mentioned in Section 4, the filter units will be isolated from the rest of the WTP building by utilizing a glass storefront. Access to the filters will be provided by a doorway located in the storefront on the side of the filters. The use of the storefront will help to keep the humidity and temperature of the water from affecting the environment of the remainder of the building. The filter area will be provided with roof-mounted exhaust units for ventilation and unit heaters for temperature control. All fixtures, light switch plates, etc., and all conduits shall be PVC coated rigid galvanized steel for corrosion control.

All surface waters are required to be in compliance with the Surface Water Treatment Rule (SWTR) and Interim Enhanced Surface Water Treatment Rule (IESWTR). These rules require filtration as a treatment technique, in combination with chemical disinfection, to provide a dual barrier against pathogenic organisms. The effectiveness of filtration is established in these rules as requiring a combined filter effluent turbidity no greater than 0.3 NTU. *Handwritten: as 95% of monthly samples*

Online turbidimeters shall be installed on the effluent line from each filter and shall report to a recorder the turbidity at least once every 15 minutes. If effluent turbidity levels exceed 0.3 NTU, an alarm shall be sounded. Most water treatment plants establish a filtered water turbidity goal well below current regulatory standards, usually 0.1 NTU. *Handwritten: lower*

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) has additional disinfection requirements that are targeted at source waters that are at risk for *Cryptosporidium*, a pathogen that is resistant to chlorination. Treatment facilities are required to achieve a certain log removal/inactivation of *Cryptosporidium* based upon the bin classification that its source water is assigned. Based on preliminary discussions with MDEQ, the Lake Huron source water is anticipated to be classified as Bin 1, which does not require any additional log removal above that of a conventional plant. If the source water ever gets classified as Bin 2, then a 1.0-log credit would be required, which can be achieved if individual filter effluent turbidity is less than 0.15 NTU in at least 95% of the daily maximum turbidity measurements, and never greater than 0.3 NTU in two consecutive measurements. Higher Bin classifications would likely require the addition of a UV disinfection system.

Four (4) additional 3.75 mgd filters can be installed in the future to meet the ultimate 45 mgd plant capacity. As a result, common piping should be designed to meet these ultimate capacities and valved blind flanges provided to accommodate these future additions with minimal shutdowns.

## SECTION 9 – CHEMICAL STORAGE AND FEED

The chemical storage and feed facilities will be located in a separate area of the water treatment plant, located so that it is close to all chemical application points as well as being accessible to facilitate delivery of all chemicals. Per Ten States Standards, all plants treating surface water shall make provisions for applying chlorine to the raw water, settled water, filtered water, and water entering the distribution system. The disinfection and fluoridation requirements will be discussed in greater detail in the next section.

### 9.1 Potassium Permanganate

Storage for potassium permanganate will be provided for feed upstream of the raw water receiving reservoir, and possibly an additional application point upstream of the rapid mix basins. This may require chemical storage and feed facilities at the east end of the property, and will be assessed during design. The addition of potassium permanganate will aid in oxidation of minerals and organics. Assuming a combined dosage of 1.0 ppm at the application points, the resultant usage of potassium permanganate is approximately 250 pounds per day of dry chemical, or 120 gallons per day of liquid potassium permanganate. Based on a required storage volume of 30 days, the total required storage amount is approximately 3,600 gallons of liquid chemical. According to Carus Chemical, this chemical is typically delivered in 4,000 gallon volumes. It is recommended that two bulk storage tanks will be provided with each having an approximate volume of 2,200 gallons and approximate dimensions of 8 feet in diameter by 7.5 feet high.

### 9.2 Powdered Activated Carbon

Powdered activated carbon (PAC) storage and feed facilities are anticipated for taste and odor control. A volumetric feeder system that uses a bag-loading hopper, dust collector, slurry tank and educator is typically used for these applications. Based on similar water treatment facilities that use Great Lakes source water, PAC is generally only required seasonally and not for long periods of time. Therefore, designing the PAC storage amount for a more typical 15 mgd flow rate over a 30 day period is a more reasonable approach. Assuming a dosage rate of 5 ppm and flow rate of 15 mgd, the resultant daily usage would be 625 pounds. This would require storage of 18,750 pounds for a 30 day supply, or approximately 470 carbon storage bags that are 40 pounds each. A typical pallet can hold 33 bags with a dimension of approximately 3.5 feet by 4 feet by 5.5 feet high. Approximately 15 pallets would be required for storage with storage area of 18 feet by 15 feet. An additional 50 percent storage footprint will be made available for future carbon storage considerations.

### 9.3 Coagulant

Addition of coagulants will occur upstream of the in-line static mixers, which can include chemicals such as alum, ferric chloride, ferric sulfate and polymers as coagulant aids. The combination and dosage of chemicals for the incoming raw water will be determined from jar test results performed by plant staff once the plant is operational. These test results will optimize floc formation in the flocculation basins for subsequent settling in the sedimentation basins. Assuming a relatively high coagulant dosage rate of 15 ppm at the plant design capacity of 30 mgd, the storage volume required for a 30 day supply of ferric chloride is

approximately 4,775 gallons. Two bulk storage tanks can be provided with 5,000 gallons capacity (2 month supply), with approximate dimensions of 10.5 feet in diameter by 8 feet high.

#### 9.4 Polymer

Upstream of the filters, polymer will be added to enhance/aid the filtration process. In addition, polymer may be added to sludge from the sedimentation basins and backwash water waste lines to allow for better settling in the backwash ponds. Assuming a maximum dosage rate of 1 ppm, the resultant daily usage would be 250 pounds per day, or approximately 25 gallons. A 30 day supply is approximately 675 gallons. Since these chemical are typically delivered in 4,000 gallons, it is recommended that the tanks have a total volume of 4,000 gallons, which would be approximately a 6 month supply. However, per discussions with Carus Chemical, the expected shelf life of polymers can be as low as 3 to 6 months. Therefore, it is recommended that one bulk storage tank be provided with an approximate volume of 2,000 gallons and approximate dimensions of 7 feet in diameter by 7 feet high. Once a specific type of polymer is selected during design, the degradation rate should be evaluated to determine if a six month shelf life is acceptable, and if the sizing of tank(s) can be approximately 4,000 gallons to match typical truck delivery volumes.

#### 9.5 Corrosion Inhibitor

A corrosion inhibitor, such as phosphate, will be added to the finished water leaving the plant for sequestering of soluble metals and to inhibit corrosion. The storage facilities will be provided by two (2) vertical, flat bottom, closed top fiberglass bulk storage tanks. Assuming a maximum dosage rate of 5 ppm (83.5 lbs per million gallons) and a plant design capacity of 30 mgd, the required 30 day storage volume is approximately 37,500 pounds, which is equivalent to approximately 3,300 gallons. The full tank truck delivery volume of 4,000 gallons will be sufficient to provide over 30 days of storage volume. The two bulk storage tanks will have an approximate volume of 2,200 gallons each and have approximate dimensions of 8 feet in diameter by 7.5 feet high.

#### 9.6 Chemical Feed Rate and Storage Considerations

The dosages of these chemicals will depend on a detailed analysis of the raw water, testing of flocculation using jar tests to determine optimum combination of chemicals, and various other considerations during the design of these water treatment facilities. The jar tests are anticipated to be performed by plant staff once the plant is operational. The optimal chemical feed rates will then be determined. In addition to the chemical storage tanks, there will be provisions for transfer pumps, day tanks, feed pumps and all other related equipment. All liquid containing tanks will be located within a concrete spill containment area, and all chemical metering pumps will be provided with calibration chambers. Space should be provided for future additions to accommodate an ultimate capacity of 45 mgd.

### SECTION 10 -- DISINFECTION AND FLUORIDATION

According to Ten State Standards, the chlorinator capacity shall be such that a free chlorine residual of at least 2 mg/L (ppm) can be maintained in the water once all demands are met after an effective contact time of at least 30 minutes when maximum flow rate coincides with anticipated maximum chlorine demand. In addition, minimum free chlorine residual in a water

distribution system should be 0.2 mg/L. In order to maintain these chlorine residuals, chlorine dosage rates are expected to range from 1 to 5 mg/L, with an average dosage rate of approximately 3 mg/L. The chlorination feed equipment will be sized for a maximum dosage rate of 5 ppm, or 42 lbs per MG. At a flow of 30 mgd and 3 ppm dosage rate, this equates to 756 lbs of chlorine per day, and at flow of 30 mgd and 5 ppm dosage rate, this equates to 1,260 lbs of chlorine per day.

Per Ten State Standards, 30 days of chemical storage is required based on average day flows. The chlorine storage room will be sized to accommodate the storage of one-ton containers that can deliver average dosage rates of 3 ppm for 30 days at an average day flow of up to 30 mgd. Storage requirements for various plant flow rates are provided in Table 2. Based on the storage of 12 one-ton containers, the approximate size of the chlorine storage and feed room would be 20 feet wide by 55 feet long. In the future, when the plant is expanded to 45 mgd, the chlorine will need to be delivered on a more frequent basis during high demand periods.

Table 2  
Estimated Chlorine Usage Rates\*

| Flow, mgd | Usage Rate, lbs per day | Ton Containers Used in 30 Days |
|-----------|-------------------------|--------------------------------|
| 15        | 378                     | 5.7                            |
| 20        | 504                     | 7.6                            |
| 30        | 756                     | 11.3                           |

\*Based on average dosage rate of 3 mg/L.

The chlorine feed and storage area will be housed in an enclosed area separate from the operating areas of the water treatment plant, and there will be viewing windows into these rooms. The storage and feed rooms will have a scrubber system, designed in accordance EPA and MDEQ requirements to contain, absorb and neutralize the release of any chlorine gas and discharge the remaining gas to the outside. It should be noted that the chlorine storage and feed rooms will only be accessible from outside to prevent any spread of chlorine gas to the rest of the water treatment plant building if a release occurs. In addition, the chlorine storage room will be equipped with a monorail system extending outside the building to transport one-ton cylinders from truck bed to storage.

Fluoride is added as hydrofluosilicic acid to aid dental health. On the downstream side of the high service pumps, fluoride will be added such that the concentration leaving the plant is approximately 0.7 mg/L. Fluoride is added after filtration to prevent unwanted chemical reactions. Assuming a dosage rate of 0.7 ppm, at plant rated flow of 30 mgd the usage rate is 79.1 gpd. Based on a required storage volume of 30 days, the total required storage amount is approximately 2,500 gallons. It should be noted that hydrofluosilicic acid should be isolated from other areas of the plant due to its ability to etch glass and other surfaces.

It is anticipated that two fiberglass storage tanks will hold the hydrofluosilicic acid, each with an approximate volume of 2,500 gallons and approximate dimensions of 8 feet in diameter by 7 feet high. Also included will be two transfer pumps (1 on standby) that will be provided to pump directly from the storage tank to a day tank. A diaphragm metering pump will then pump the fluoride to the finished water. Space should be provided for future additions to accommodate an ultimate capacity of 45 mgd. It should be noted that bulk storage amounts should be based on delivery amounts, as well as possible, in order to make delivery as economical as possible.



## SECTION 11 – FINISHED WATER STORAGE [needs updated following GCDC-WWS comment]

The filtered water from the filters will flow by gravity into a finished water reservoir, which will be constructed of reinforced concrete, consisting of two cells separated by a reinforced concrete dividing wall, and internal baffling walls to prevent short circuiting. The use of a two cell arrangement allows one cell to be taken out of service while the second cell is maintained in operation. The reservoir cells will normally operate in parallel, each handling half the plant flows, but will be arranged such that either can be taken out of service with flow continuing through the remaining reservoir cell.

03 1 A minimum baffling factor of 0.5 is anticipated to be applied to the interior of the reservoir cells, which is considered an average baffling condition, and includes a baffled inlet or outlet with some intra-basin baffles. However, improving the baffling factor to 0.7 would improve the chlorine contact time effectiveness in the reservoir, and would need to include perforated inlet baffle, serpentine or perforated intra-basin baffles and outlet weir or perforated launders.

Per the Surface Water Treatment Rule (SWTR), surface water treatment plants are required to provide a 3-log (99.9%) removal or inactivation of Giardia and a 4-log (99.99%) removal or inactivation of viruses. The SWTR generally makes the assumption that an effectively operated conventional water treatment plant is capable of achieving a 2.5-log removal of Giardia and a 2-log removal of viruses. However, the final design will need to undergo review by Michigan Department of Environmental Quality to determine actual removal credits for the plant and is also anticipated to be dependent on plant performance once it is operational. Disinfection is needed to provide the remaining inactivation and removal, which if the plant receives the expected 2.5-log removal of Giardia and a 2-log removal of viruses, will be 0.5-log for Giardia and a 2-log removal of viruses.

The log removal through disinfection is determined by the CT concept, which involves the product of the residual disinfectant concentration and the contact time between the point of disinfectant application and residual measurement. The CT tables provided in the EPA Guidance Manual, Disinfection Profiling and Benchmarking indicate the log-removal awarded for different CT values based on the disinfectant used, pH and temperature. This required disinfection CT value was calculated based on 0.5-Log inactivation of Giardia with a chlorine residual of 1 mg/L at a finished water pH of 8.0 and temperature of 0.5 °C. Additional disinfection CT would need to be provided for future plant flows of 45 mgd by reservoir expansion.

The reservoir capacity based on varying baffle factors for the finished water transmission mains are shown in Table 3. Note that the backwash volumes may be significantly reduced with the use of multi-wash, central control column type filters where backwash water is derived from the effluent from the other in-service filters; as such the total reservoir capacities below are a bit conservative.

Limits in treatment train

**Table 3**  
**Required Reservoir Capacities (MG)**

| Baffle Factor | Two Filter Backwashes (MG) | Equalization Storage (MG)* | Disinfection CT (MG)^ | Total Required Reservoir Capacity (MG) |
|---------------|----------------------------|----------------------------|-----------------------|----------------------------------------|
| 0.3           | 0.52                       | 0.21                       | 3.55                  | 4.28                                   |
| 0.5           | 0.52                       | 0.21                       | 2.13                  | 2.86                                   |
| 0.7           | 0.52                       | 0.21                       | 1.52                  | 2.25                                   |

\*Equalization storage based on 10 minutes at 30 MGD

^CT Volume based on initial 30 mgd design rate

Based on these findings, we recommend that a baffle factor of 0.7 be provided inside the reservoir cells with a total required reservoir capacity of 2.25 MG, pending MDEQ approval. Based on our knowledge at this point, we anticipate the finished water reservoir to have the following characteristics:

Finished Water Reservoir

|                   |                                               |
|-------------------|-----------------------------------------------|
| Type:             | Cast in place concrete with internal baffling |
| Baffling Factor:  | 0.7                                           |
| Number of Cells:  | 2                                             |
| Length:           | 140 feet (each)                               |
| Width:            | 75 feet (each)                                |
| Side-water depth: | 15 feet                                       |
| Total Volume:     | 2.25 MG total                                 |

### SECTION 12 – FINISHED WATER PUMPING

Finished water will be pumped from a divided wet well that will be supplied from the finished water reservoir by new high service pumps and provide sufficient pressure for the customers along the way. These pumps will convey the water through a 48-inch diameter finished water transmission main from the new water treatment approximately 8 miles to just outside of the Henderson Road Pumping Station and Reservoir site. From this point the water will either go south to the existing 72-inch diameter water main or west to the Henderson Road reservoirs. An alternate route being considered for the finished water transmission main is a route approximately 6.5 miles long to the City of Lapeer. Once the final route is known, a hydraulic analysis will need to be completed to verify the preliminary design criteria shown below.

While the number and capacity of pumps can be varied, for this preliminary analysis it is assumed that four 7.5 mgd pumps will be provided with an additional 7.5 mgd pump on standby. For future considerations, the pump impellers or pumps themselves may need to be swapped out as necessary to meet higher flow conditions. The estimated head requirement for each of these pumps is 232 feet, which will need to be verified upon final transmission main route and high service pump elevation determination. Variable speed drives are not being considered at this time.

|                    |                        |
|--------------------|------------------------|
| Type:              | Vertical turbine pumps |
| Number of units:   | 4, plus 1 on standby   |
| Capacity per unit: | 7.5 mgd                |

AH Low + HSP  
locations  
for security?

2% of Use

|                              |                                 |
|------------------------------|---------------------------------|
| Total firm pumping capacity: | 30 mgd                          |
| Total dynamic head:          | 232 feet                        |
| Horsepower:                  | 380 hp at 80 percent efficiency |

### SECTION 13 - WASTE RECLAMATION AND DISPOSAL

The filter backwash waste and sludge from the sedimentation basins will be conveyed to and retained within backwash ponds. It is anticipated that each filter will be backwashed approximately every 48 hours, or 4 filters backwashed per day. Each filter backwash will result in approximately 260,400 gallons backwashed, based on a maximum backwash rate of 20 gpm per square foot of filter area and a duration of 15 minutes. This results in a washwater volume of 1,042,000 gallons per day.

It is anticipated that the sludge blow-down from the sedimentation basins will produce approximately 4,200 gallons per day at a 30 mgd plant capacity. However, this will need to be validated once the coagulant types and dosages are known based on jar test results, which are expected to be performed by plant staff once the plant is operational. Each pond will be sized to hold one year volume of sludge, which is estimated to be a volume of 205,000 cubic feet at 30 mgd plant capacity. The lagoons will be sized based on a length to width ratio of 3 to 1 and side slopes of 3 to 1, with a maximum depth of 10 feet plus 3 feet of freeboard. Based on this, the estimated dimensions for each of two (2) ponds will be approximately 110 feet wide by 320 feet long, and each with a volume of approximately 1.6 MG based on an average depth of 6 feet.

#### Backwash Ponds

|                          |                                |
|--------------------------|--------------------------------|
| Quantity:                | 2 (space for third in future)  |
| Approximate size (each): | 110 feet wide by 320 feet long |
| Side slope:              | 3:1                            |

The supernatant will be decanted and returned to the beginning of the plant treatment train by pumping at a maximum rate of 10% of the total raw water flow, or back to the 150 MG reservoir. The decant can also be discharged to a stream, if accessible, and a NPDES permit would need to be obtained.

The backwash ponds will be located such that their maximum liquid level will be above the 100-year flood elevation to prevent flooding. The lagoons will be provided with a concrete ramp to allow the use of a rubber tired front-end loader to remove the settled and dewatered sludge accumulated in the lagoons, as necessary. Then the sludge will be transported for disposal at an approved landfill.

### SECTION 14 - SCADA

Monitoring of all processes at each of the KWA, as well as WTP, facilities will be received at the Genesee County Water Treatment Plant's main control room. The central control facility located on the first floor will have redundant operator workstation computers for SCADA System graphics, operation, alarms and database management. A separate computer will be provided for report generation and engineering. The receiving reservoir and raw water pumping facilities at the plant will be monitored and controlled by a local Programmable Logic Controller (PLC). Each location shall have an Uninterruptable Power Supply (UPS) system with sufficient capacity

redundant storage of configurations Monitoring Turbidity etc



for up to 8 hours of backup power for operation of the SCADA equipment in the event of a power interruption.

Industrial computer touchscreens will be used to monitor the pump station operations and to change any desired set-points. The industrial computer touchscreens will be password protected.

At this time, it is planned that the plant may only be operated 8 to 12 hours per day versus 24 hours per day. The necessary coordination and potential issues associated with starting/stopping the plant will need to be evaluated and discussed during the design of the plant.

The following systems will be included for the control and monitoring of the Raw Water Pump Station:

- Pump performance, status and control
- Chemical system control and pacing (as applicable)
- Residual chlorine
- Discharge pressure
- Discharge flow
- Alarms
- Station unauthorized access
- CCTV surveillance data
- Raw water reservoir level

The following is a preliminary input-output point schedule for the finished water pumps. A complete input-output point schedule for the water treatment plant will be developed during design.

- |                                       |    |
|---------------------------------------|----|
| • Finished Water Pump No. 1 – Start   | DO |
| • Finished Water Pump No. 1 – Stop    | DO |
| • Finished Water Pump No. 1 – Running | DI |
| • Finished Water Pump No. 1 – In Auto | DI |
| • Finished Water Pump No. 2 – Start   | DO |
| • Finished Water Pump No. 2 – Stop    | DO |
| • Finished Water Pump No. 2 – Running | DI |
| • Finished Water Pump No. 2 – In Auto | DI |
| • Finished Water Pump No. 3 – Start   | DO |
| • Finished Water Pump No. 3 – Stop    | DO |
| • Finished Water Pump No. 3 – Running | DI |
| • Finished Water Pump No. 3 – In Auto | DI |
| • Finished Water Pump No. 4 – Start   | DO |
| • Finished Water Pump No. 4 – Stop    | DO |
| • Finished Water Pump No. 4 – Running | DI |
| • Finished Water Pump No. 4 – In Auto | DI |

## **SECTION 15 – ELECTRICAL FACILITIES**

Electric power will be supplied to the WTP by DTE Energy Primary Services. The WTP will have an electrical substation consisting of two 120-4.16kV 15 MVA transformers (delta – resistance grounded wye, LTC) with 120-kV circuit switchers or circuit breakers to provide protection to the 120-kV transformers. Refer to Figures E1 and E2, and E3 for preliminary single line diagrams of the electrical substation, water treatment plant and the raw water pump station.

Main switch gear electrical controls shall be located above grade, in areas not subject to flooding. All electrical work shall conform to the requirements of the National Electrical Code or to relevant local codes. At this time, backup generators will not be provided. However, a small diesel, or natural gas if available, generator with a base-mounted fuel tank will be provided to supply backup for selected loads, including equipment necessary for a controlled water plant shutdown with minimal HVAC, lighting, SCADA and security in case of power failure.

It should be noted that the plant will have some built-in reliability with finished water storage available at Henderson Road Pumping Station and an emergency connection with the City of Flint, which has a backup water supply from the Flint River.

Outdoor site lighting will be provided in the parking areas and driveways. Photo controlled LED type lights will be installed above entrance doors and along sides of the building exterior. Interior lighting fixtures will be LED type, where available. The lighting will be located and directed, as possible, to avoid interference with neighbors.

## **SECTION 16 – MECHANICAL FACILITIES**

### **16.1 Heating and Air Conditioning**

In the absence of a gas supply line in the vicinity of the water treatment plant, the source of energy is expected to be either electric or propane. Propane will need to be stored on-site in an underground tank sized to permit storage of approximately a 30 day supply. The tank would be double-wall construction, and be constructed, installed and monitored in accordance with applicable MDEQ regulations and NFPA standards. AECOM performed a preliminary energy cost estimate and comparison between electric and propane. The findings indicate that the annual operating costs of propane (approximately \$468,000) are nearly three times those of electric (approximately \$175,000). Therefore, it is recommended that electric, rooftop packaged air-handling units be utilized for heating and air conditioning of the plant (See Appendix B for evaluation).

It is proposed to use a constant volume air handling unit to supply conditioned air to the offices, entrance lobby, lunch room, training area and locker rooms. Temperature control to separate zones will be accomplished with dampers. A separate air handling unit is proposed to supply conditioned air to the laboratory area. Each air handling unit will be equipped with electric heating coils, DX cooling coils, filters and controls to maintain the spaces at approximately 70 degrees during winter months and 78 degrees during summer months. Each unit shall be equipped with an economizer system which will utilize outdoor air for cooling when practical. The unit serving the laboratory will be equipped with an electric type evaporator section to

provide humidity control. Air exhausted or recirculated from the laboratory area will not be distributed to any area of the building.

Balanced air type fume hoods will be utilized for the laboratory. A combination supply fan with ductwork and an electric heating coil will be used to provide makeup air directly to each fume hood. The makeup air will be taken directly from the outdoors and shall be heated to a minimum temperature of 70 degrees Fahrenheit. Each fume hood will be individually exhausted directly to the outdoors.

It is proposed to provide electric unit heaters in the chemical storage, chemical feed, maintenance, parts storage, mechanical room and filter areas to maintain the space temperatures. Space temperatures will be maintained at 60 to 70 degrees Fahrenheit in all spaces except the flocculation/sedimentation basin and filter areas. Localized heating will be provided in the filter area only over the operating console area.

#### 16.2 Ventilation

It is anticipated that constant volume air handling units will provide ventilation air to the maintenance, chemical feed, storage areas, electrical room and other operating areas. The units will be located in the mechanical room and each unit will be equipped with electric heating coils, filters and controls to supply air to the room spaces. All air supplied by the ventilation units will be exhausted to the outdoors and none recirculated.

Dedicated air handling units will be provided that provide ventilation air to the chlorine feed and chlorine storage rooms. These rooms will have no interior passages to the remainder of the building and will have no duct connections to the remainder of the building. The unit will be a once through type located in the chlorine storage room. The air handling unit will be equipped with electric heating coils, air filters and controls to supply air at a constant temperature of 70 degrees Fahrenheit. Air will be continuously supplied at a rate that will provide approximately 6 complete air changes per hour in each room. All air from the chlorine feed and storage rooms will be exhausted directly to the outdoors and none will be recirculated. The chlorine storage and feed rooms will be equipped with an emergency ventilation and scrubber system. Outdoor air for emergency ventilation will be drawn directly into the room and will not be tempered. The emergency ventilation rate will be one room change per minute. Each emergency ventilation fan will be started by a manual switch located on the exterior face of the building wall at each room entrance. Each fan will also be started by a door switch, which shall automatically start the fan when the door is opened. A manual switch will be located on the exterior face of the building for stopping the fan operation upon leaving the room.

Building toilet and locker rooms will be exhausted by power roof ventilators at the rate of two standard cubic feet per minute per square foot of floor space. Air from toilet rooms will be exhausted directly to the outdoors.

Air handling units will provide ventilation air to the filter area, and flocculation and sedimentation basin areas. The unit will be equipped with electric heating coils, air filters and controls to supply air to the space at a constant temperature of approximately 50 degrees Fahrenheit. The unit will be a 100% outdoor unit type. The supply air will be exhausted and non-recirculated. Air will be supplied at a rate that will provide approximately one air change per hour, with

potential for reduced air changes in winter months. In addition, the walls in these areas will be ventilated in order to prevent icing on the walls during the winter months.

Building maintenance, storage rooms, chemical storage and feed areas, general laboratory exhaust, electrical and lunch rooms will be exhausted by roof or wall mounted fans, as required. The fans will be electrically interlocked with the respective supply fans to run when the supply fan runs and will exhaust at the same rate as the air being supplied to the room. A hand-off automatic switch will be provided on each fan to permit each fan to be controlled individually. Additional fans will be provided for excess heat removal from the electrical and mechanical rooms and the pump area, and they will be thermostatically controlled. All other fans will be manually started and stopped.

### 16.3 Potential Utilization of Liquid Cooled Heat Pumps

The proposed water filtration plant will be equipped with enclosed flocculation basins, sediment basins, and filter beds. These areas will have large exposed water surfaces and a consequent need for large quantities of outdoor air ventilation to control potential condensation within the building. The need for large quantities of outdoor air requires tempering of the air under winter conditions and thus large quantities of heat. To satisfy this heat load and in addition, the conventional heating needs required of the facility such as office areas, storage areas and pump rooms, it is possible that the use of water cooled heat pumps could be employed.

Water cooled heat pumps having a 200 to 300 ton capacity could take advantage of the available heat in the proposed reservoir area constructed at the inlet to the plant. Assuming that the water temperature of this water would be at a minimum of 35 degrees F, a heat pump could bring this water through the evaporation side of the refrigerant compression cycle, extract the heat to the evaporator passing a glycol-water blend held at 25 degrees F, and extract heat from the compression side of the refrigeration cycle at 120 degrees F. The 120 degrees F water could then be pumped to the point of heating demand at 120 degrees F and released within hot water coils installed within air handling units.

The heat pump has a coefficient of performance (COP) of approximately 3, meaning that for every kwhr of electrical energy applied to the heat pump, 3 kwhr of heat is extracted and available to satisfy the heating demand. However, there will be pumping energy required in addition to the chiller load. It is estimated that 100 horsepower of energy will be required for 200 tons of heat pump capacity. This will reduce the effective system COP to the order of 2.5.

In consideration of the fact that the plant is located remote from sources of natural gas, and that reliance on electrical energy for heating is expensive, it is recommended that the use of liquid source heat pumps be explored.

### 16.4 Plumbing

The plant high service header will be the source of water for internal facility use. Pressure reducing valves will be provided to reduce the water pressure for domestic use to 70 psig and as required for process use. Backflow preventers will be installed in water supply lines to potential contamination sources such as the laboratory, chemical tanks, etc., to protect the water system.

An electric storage type water heater will be provided to supply domestic hot water to the lunch room, showers and sinks. The domestic hot water will be supplied at approximately 120 to 140 degrees Fahrenheit.

Water will be piped throughout the building, and hose bibs and hydrants will be located throughout the interior of the building to facilitate wash-down and cleanup. Hydrants located on exterior walls or exposed to the outdoor atmosphere will be the non-freeze type.

The laboratory and all chemical handling areas will be equipped with emergency showers and eye washes. All safety equipment will be located in accordance with applicable codes and OSHA requirements. Plug type drains shall be provided for all liquid chemical storage areas. Any spilled or leaked liquid will be contained in a confined area to allow recovery of the chemical. For wash-down and drainage of the chemical areas, the plug drain can be opened for proper disposal in a holding tank for pickup by others, or if allowable, disposal to the septic field.

A waste, drain and vent system will be provided to collect wastes from the sanitary units and waste drains, and transfer the wastes to an on-site septic system. The on-site septic system will include the septic tank and a drainage field. All waste and drain system will drain by gravity where possible. At points where the origin of the waste is at a lower elevation than can be drained by gravity, suitable sumps and sump pumps will be located to pump the wastes to the gravity system. It is anticipated that the septic field will be constructed on-site somewhere on the property.

#### SECTION 17 - SECURITY

*has VA based on  
prelim design*

An Integrated Security Management System is recommended that will incorporate close circuit monitoring with intelligent video analytic capabilities, access control (e.g. security access card reader system), intrusion detection, security communication systems and have capabilities for additional systems such as for access card management and personnel security information management.

The water treatment plant site is anticipated to be equipped with cameras and other equipment needed for an integrated video surveillance system. As a minimum, the plant shall be equipped with one motion sensing pan-tilt-zoom (PTZ) camera and two fixed cameras on exterior access points with infrared (IR) illuminators. Signals will be transmitted to security system workstations at the central control facility at the Genesee County Water Treatment Plant, and may also be transmitted to the County's Henderson Road Pump Station and/or other GCD-C-WWS facilities. Signals from the cameras will be recorded and archived, according to pre-established criteria depending on video analytics algorithm or as determined by security staff.

An access control system is anticipated, including associated hardware and software that will have dual capabilities to accommodate existing access cards and common access cards (CAC's) for card readers. Motion sensing activated lighting should be installed on exterior grounds of all facility sites. In addition, installation of motion detectors inside unmanned buildings equipped with intrusion alarms should be considered. Perimeter fencing is anticipated to be located at the Genesee County Water Treatment Plant and receiving reservoir site. It is recommended that after the Genesee County Water Treatment Plant facilities are constructed, that a more comprehensive Vulnerability Assessment (V/A) is conducted that includes, at a minimum, a review of water conveyances, physical barriers, water collection,

pretreatment, treatment, storage and distribution facilities; electronic, computer or other automated systems which are utilized by the public water system, the use, storage, or handling of various chemicals, and the operation and maintenance of such systems. This document should be completed in accordance with EPA requirements.

## **SECTION 18 - APPLICABLE CODES**

### **18.1 Architectural and Structural Codes**

1. The Michigan Building Code 2009 (MBC)
2. ICC/ANSI A117.1, except sections 611 and 707
3. The International Fire Code 2009 (IFC)
4. NFPA 101, Life Safety Code, 2009 Edition
5. NFPA 72, National Fire Alarm Code, 2009 Edition
6. NFPA 52, National Fire Alarm Code, 2009 Edition
7. OSHA, United States Department of Labor, Occupational Safety and Health Administration, Latest Edition
8. Building Code Requirements for Structural Concrete, (ACI 318-08) and Commentary, (ACI 318R-08).
9. Code Requirements for Environmental Engineering Concrete Structures and Commentary (ACI 350-06).
10. Seismic Design of Liquid Containing Concrete Structures and Commentary, (ACI 350.3-06).
11. Specification for Structural Steel Buildings – Thirteenth Edition, 2005
12. Steel Construction Manual, Thirteenth Edition, 2005
13. Building Code Requirements for Masonry Structures and Commentary, TMS 402-08/ ACI 530-08/ ASCE 5-08 and Specification for Masonry Structures and Commentary, TMS 602-08/ ACI 530.1-08/ ASCE 6-08
14. American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures, ASCE 7-05.
15. American Association of State Highway and Transportation Officials, AASHTO, Standard Specifications for Highway Bridges, Seventeenth Edition, 2002
16. Report on Geotechnical Investigation for the Pump Station and Water Treatment Plant, KWA Water Supply System, Contract No. S5001, Oregon Township, Lapeer County, Michigan, prepared by Somat Engineering, dated February 26, 2014 (DRAFT).

### **18.2 Electrical Codes**

1. NFPA-70 National Electrical Code, 2014 Edition
2. ANSI-C2-National Electrical Safety Code
3. NFPA 70E Electrical Safety for Employee Workplaces
4. NFPA 79 Electrical Standard for Industrial Machinery, 1994 Edition
5. NFPA 72 National Fire Alarm Code
6. NFPA 101 Life Safety Code
7. NECA National Electrical Installation Standard
8. Institute of Electrical and Electronics Engineers (IEEE), "Color Book" series
9. Underwriters Laboratories (UL)
10. National Electrical Manufacturer's Association (NEMA)

11. Insulated Cable Engineers Association (ICEA)
12. Illuminating Engineering Society of North America (IESNA) "The IESNA Lighting Handbook – Reference & Application, 10th Edition"

#### 18.3 Mechanical Codes

1. Recommended Standards for Water Works; Great Lakes – Upper Mississippi River Board of State Provincial Public Health and Environmental Managers (Ten States Standards)
2. National Fire Protection Association Codes
3. National Fire Protection Association Life Safety Code
4. American National Standards Institute (ANSI)
5. American Society For Testing Materials (ASTM)
6. Michigan Plumbing Code
7. Michigan Mechanical Code
8. International Plumbing Code
9. International Mechanical Code 2009

### SECTION 19 – ARCHITECTURAL, STRUCTURAL, GEOTECHNICAL DESIGN CRITERIA

#### 19.1 Loads - Tanks, Channels and Structures Below-Grade:

- Hydrostatic liquid pressure-operating water level/flood water level – 62.4 psf.
- Lateral earth pressure for active, at-rest and passive conditions – Per Geotechnical Report (lateral load due to surcharge loading of H-20 truck will be added).
- Frost depth – Minimum 3'-6" below finished grade.
- Design high ground water table elevations. All new structures will be checked for buoyancy for the case of design high ground water table or 100-year flood water level, whichever is greater, and dead load of the structure. Based on this data, the geotechnical report recommends that a high groundwater table elevation of ~~XXX.XX~~ feet be used for design at the plant. All grade floor elevations of buildings will be set a minimum of 1 foot above the flood elevation in accordance with Michigan Building Code and Michigan Department of Environmental Quality Standards. Refer to the geotechnical report in Appendix A.
- Roof Slab at or below Grade:
  - DL: Weight of concrete slabs
  - SDL: Backfill and other superimposed dead loads including underhung ancillary equipment and piping
  - LL: 300 psf or H-20 truck loading whichever governs

#### 19.2 Loads - Buildings and Miscellaneous Structures:

Loadings for design of the building will be obtained from appropriate codes; however, certain minimum loads will be used as shown in Part 6.1.2.3. below.

Minimum Uniform Live Loads:

---

|   |                                                                                                                                                                                  |                    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| • | Checkered Plate                                                                                                                                                                  | 150 psf            |
| • | Grating                                                                                                                                                                          | 100 psf            |
| • | Stairs and catwalks                                                                                                                                                              | 100 psf            |
| • | Electrical control rooms:                                                                                                                                                        | 250 psf            |
|   | Estimate support area and equipment weights and assume loads applied anywhere in area                                                                                            |                    |
| • | Heavy Equipment rooms                                                                                                                                                            | 300 psf            |
|   | Dismantling and storage                                                                                                                                                          |                    |
| • | Storage areas:                                                                                                                                                                   | 150 psf            |
|   | Determine reasonable stacking height and type of stored material                                                                                                                 |                    |
| • | Shop floors                                                                                                                                                                      | 150 psf            |
| • | Garage floors:                                                                                                                                                                   | 150 psi            |
| • | Truck wheel loads per AASHTO and as appropriate                                                                                                                                  |                    |
| • | All other                                                                                                                                                                        | 150 psf            |
| • | Basic wind speed (3 second gust)                                                                                                                                                 | 90 mph             |
| • | Equivalent basic wind speed (fastest mile wind speed)                                                                                                                            | 76 mph             |
| • | Wind Importance Factor                                                                                                                                                           | 1.15               |
| • | Ground snow load for Lapeer County, Oregon Township                                                                                                                              | 30 psf             |
| • | Design snow load (minimum)                                                                                                                                                       | 30 psf             |
| • | Snow Importance Factor                                                                                                                                                           | 1.20               |
| • | Snow drift loads will be checked where applicable in addition to all top supported and under hung ancillary equipment and piping being hung from or being supported on the roof. |                    |
| • | Underhung piping and equipment in addition to the required minimum live load (minimum)                                                                                           | 50 psf             |
| • | Equipment live load plus 50 psf on adjacent areas, or minimum                                                                                                                    |                    |
| • | uniform live load, whichever is greater                                                                                                                                          |                    |
| • | Seismic - Oregon Township, Lapeer County, Michigan:                                                                                                                              |                    |
|   | Buildings and Non-Liquid Containing Structures (IBC):                                                                                                                            |                    |
|   | Seismic use group                                                                                                                                                                | Group IV           |
|   | Seismic design category                                                                                                                                                          | A                  |
|   | Seismic Importance Factor                                                                                                                                                        | 1.5                |
|   | Spectral response acceleration for short period (SDS)                                                                                                                            | 0.104              |
|   | Spectral response acceleration for 1 second period (SD1)                                                                                                                         | 0.065              |
|   | Soil profile name                                                                                                                                                                | Stiff soil profile |
|   | Site class                                                                                                                                                                       | D                  |

Liquid Containing Structures (ACI 350.3-06):

### 19.3 Design Stresses

1. Concrete and Reinforcing Steel:
  - a. Liquid Containing Structures:

Use ACI 350-06, Code Requirements for Environmental Engineering Structures and Commentary (ACI 350-06) and Seismic Design of Liquid Containing Concrete Structures and Commentary (ACI 350.3-06).



- Concrete compressive strength at 28 days  $f_c' = 4,500$  psi
- Reinforcing steel (A 615, Gr. 60) flexural stress  $f_y = 60,000$  psi
- Appendix C, Alternate Load Factors, Strength Reduction Factors, and Distribution of Flexural Reinforcement

b. Building and Non-Liquid Containing Structures:

Use Strength Design Method of Building Code Requirements for Structural Concrete and Commentary (ACI 318-08).

- Concrete compressive strength at 28 days  $f_c' = 4,500$  psi
- Reinforcing steel (A 615, Gr. 60)  $f_y = 60,000$  psi
- Appendix C, Alternate Load and Strength Reduction Factors

2. Structural Steel

Conform to the AISC Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design, Ninth Edition, 1989, and the Manual of Steel Construction, Allowable Stress Design utilizing the following materials.

- ASTM A 992 for W shapes, unless otherwise specified
- ASTM A 36 for angles, plates and bars
- ASTM A 325 high strength bolts
- ASTM F 1554 bar stock for anchor bolts

19.4 General Design

The following reinforced concrete structures will contain continuous PVC waterstops at all vertical and horizontal construction and expansion joints in walls and slabs:

- All fluid containing structures
- All basements and below ground structures with one surface in contact with soil or water and the opposite surface dry and exposed

Fluid applied waterproofing will be applied to the exterior surfaces of all walls with one surface in contact with soil and the opposite surface dry and exposed.

All structures below grade, including, but not limited to, basements, tanks, and other buried structures, will be designed to resist buoyancy for a high groundwater table elevation at Elevation ~~XXXXXX~~. Only the dead weight of the concrete structure below ground and soil on the foundation footings around the outside of buildings, tanks, and other buried structures will be relied on to resist buoyancy. Where dead weight of the concrete structure below ground and soil on the foundation footings around the outside of buildings, tanks, and other buried structures is not adequate to resist buoyancy, other means will be required, including, but not limited to tension piles, soil anchors or other means as recommended in the Geotechnical Report and deemed most appropriate for the various types of structures.

The following are additional general design considerations:

- Personnel doors and frames will be fiberglass reinforced plastic unless otherwise noted.
- Grating will be fiberglass reinforced plastic.
- Stairs will be constructed with steel stringers, aluminum handrails and fiberglass grating treads.
- All access hatches will be aluminum as manufactured by Bilco or equal.
- Handrails will be aluminum except in corrosive areas.

#### 19.5 Foundation Design

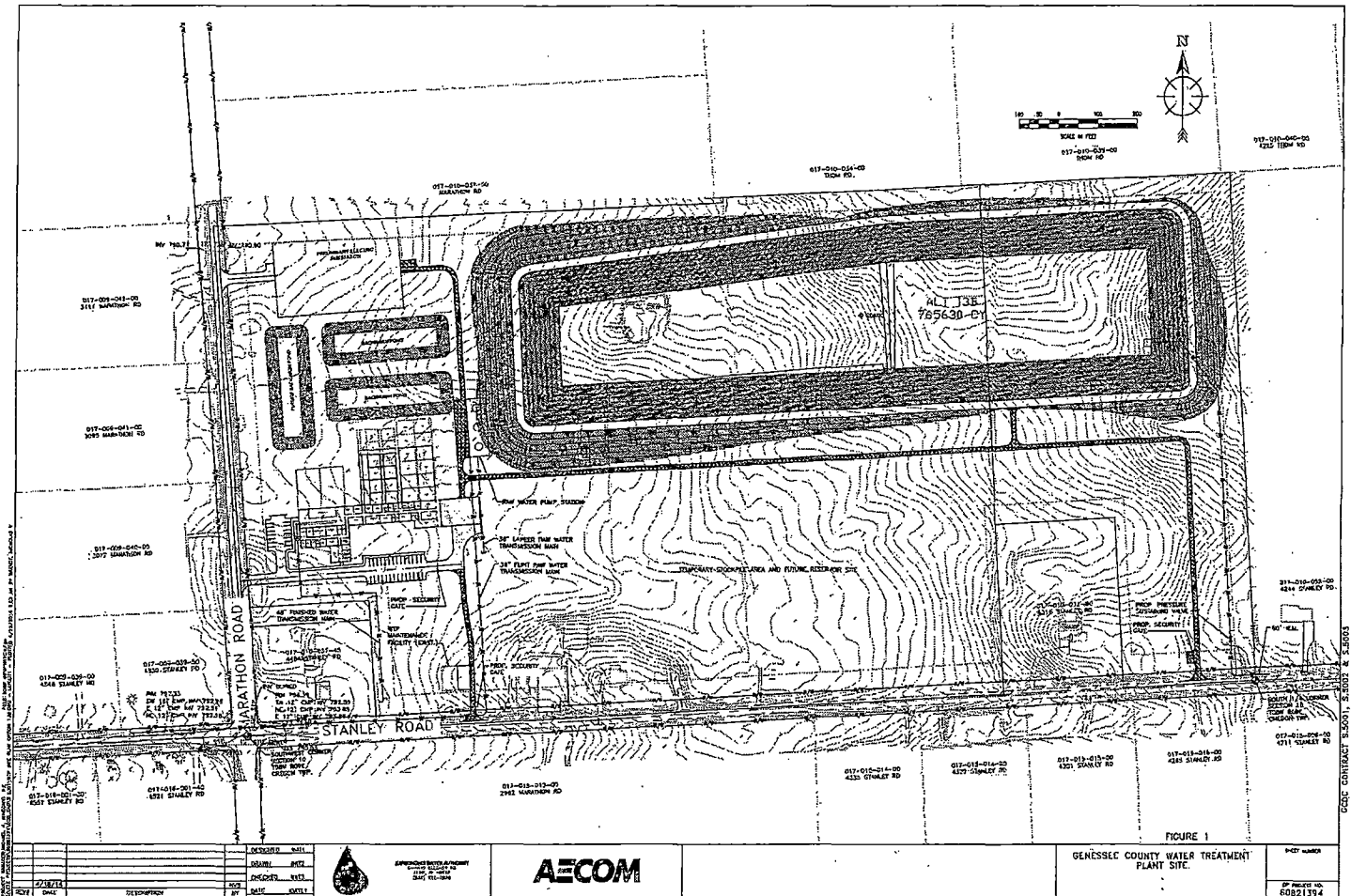
The foundation design for the various structures will be based on the recommendation in the Report and Geotechnical Investigation for the Pump Station and Water Treatment Plant, KWA Water Supply System, Contract No. S-5001, Oregon Township, Lapeer County Michigan prepared by Somat Engineering, dated February 26 2014 (DRAFT), which is in the process of being update and completed. Refer to the geotechnical report in Appendix A for soil boring logs and geotechnical recommendations.

### **SECTION 20 – GENERAL CONSIDERATIONS**

In accordance with Ten States Standards, the water treatment plant will have the capability to monitor and record turbidity, free chlorine residual, water temperature and pH at locations necessary to evaluate adequate CT disinfection and other process parameter as required by MDEQ and EPA.

Sample taps shall be provided so that water samples can be obtained from appropriate locations in each unit treatment process and from the finished water.

## FIGURES

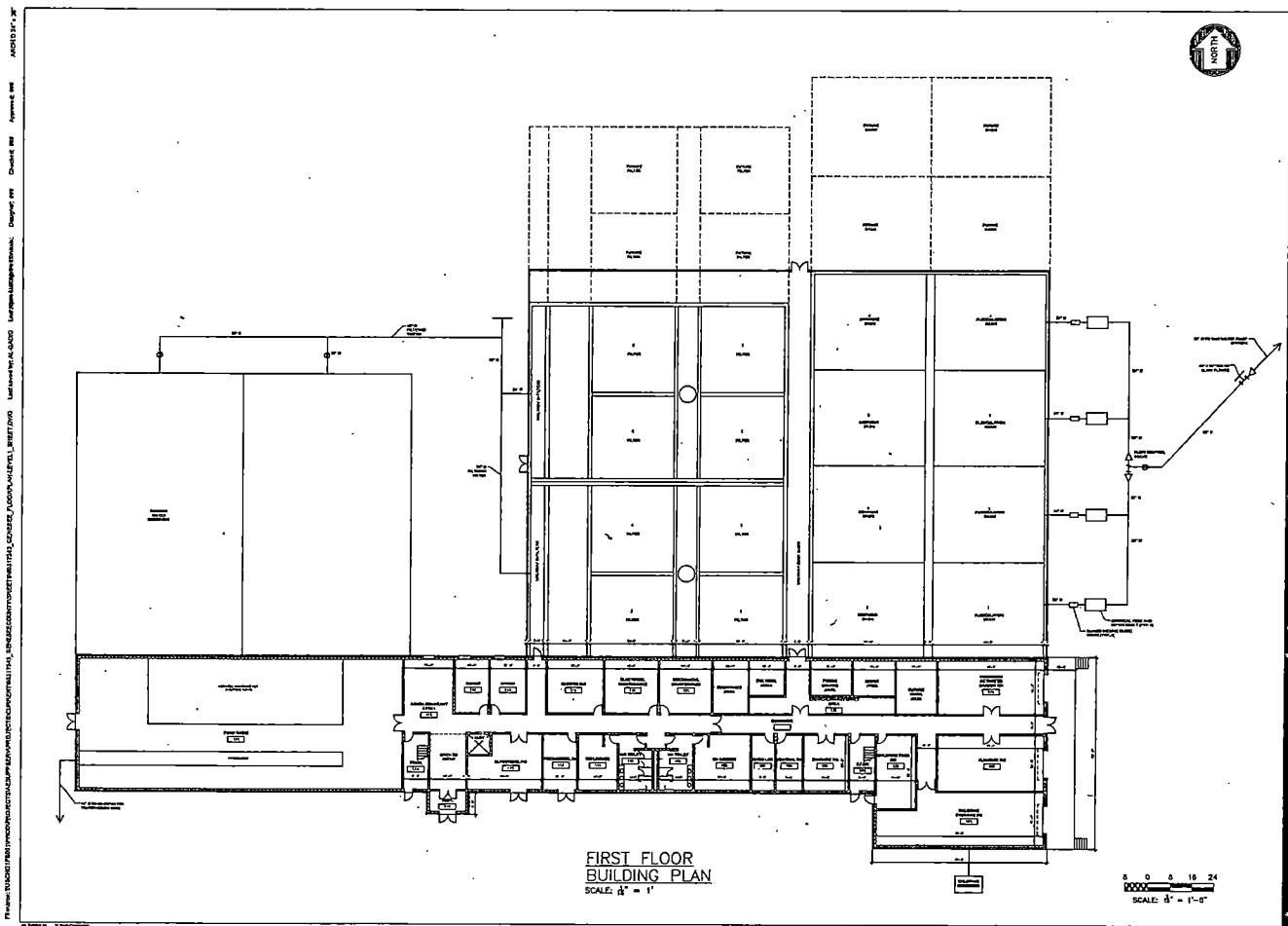


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FIGURE 2



FIGURE 3



**AECOM**  
PROJECT  
LAKE HURON  
WATER INITIATIVE

CLIENT  
GENESEE COUNTY  
DRAIN  
COMMISSIONER

CONSULTANT  
AECOM  
63247 BEECHER ROAD  
PLYMOUTH, MI 48170  
313.722.6732 ext. 610 722.6786 fax  
www.aecom.com

CONSULTANTS

REGISTRATION

ISSUES/REVISION

| NO. | DATE     | DESCRIPTION       |
|-----|----------|-------------------|
| 1   | 11/11/03 | ISSUED FOR PERMIT |

KEY PLAN

PROJECT NUMBER  
00291394  
SHEET TITLE  
GENESEE COUNTY  
WATER TREATMENT PLANT  
FIRST FLOOR BUILDING PLAN  
SHEET NUMBER  
FIGURE 4A



CLIENT  
GENESEE COUNTY  
DRAIN  
COMMISSIONER

**CONSULTANT**  
AECOM  
6-3257 BEECHER ROAD  
FLINT, MI 48532  
810 732 8712 int 810 732 8788 fax  
www.aecom.com  
**CONSULTANTS**

## REGISTRATION

### DISCUSSION/REVISION

|    |            |             |
|----|------------|-------------|
|    |            |             |
|    |            |             |
|    |            |             |
| A  | YYYY-MM-DD |             |
| LR | DATE       | DESCRIPTION |

## KEY PLAN

PROJECT NUMBER

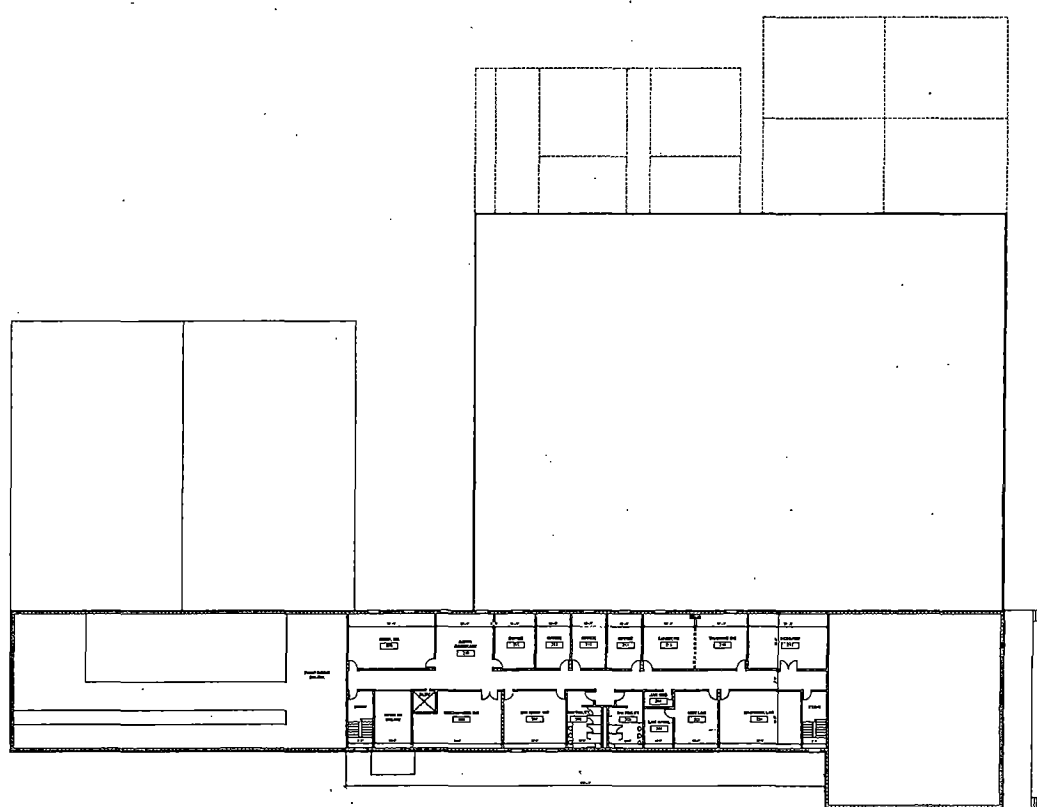
60281394

SHEET VII

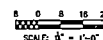
GENESEE COUNTY  
WATER TREATMENT PLANT  
SECOND FLOOR BUILDING PLAN

**SHEET NUMBER**

FIGURE 4B

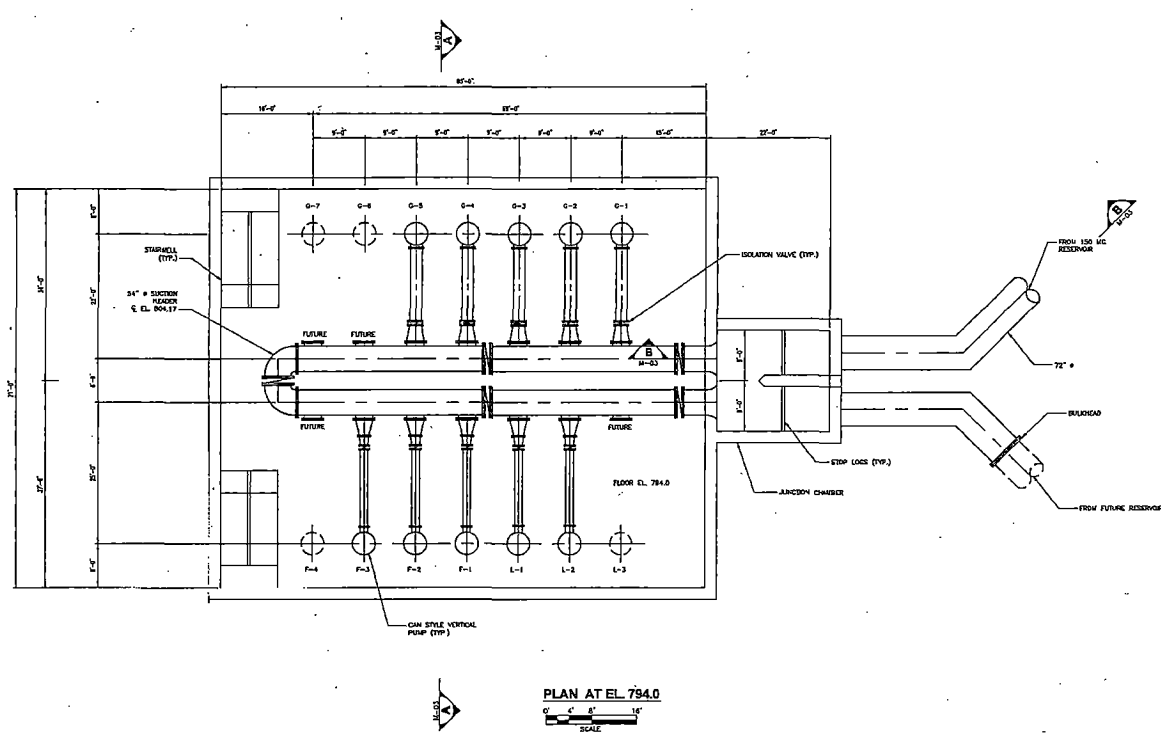


SECOND FLOOR  
BUILDING PLAN  
SCALE:  $\frac{1}{8}" = 1'$





Project: Phase 1 Raw Water Pump Station  
 Project Manager: J. J. ...  
 Designer: J. J. ...  
 Checker: J. J. ...  
 Date: 10/1/2013



PLAN AT EL. 794.0  
 SCALE: 1\"/>

**AECOM**

PROJECT  
**LAKE HURON  
 WATER INITIATIVE**

FACILITY NAME  
 Facility Address Line 1  
 Facility Address Line 2

CLIENT  
**GENESEE COUNTY  
 DRAIN  
 COMMISSIONER**

CONSULTANT  
 AECOM  
 63387 BRECHER ROAD  
 FARMING, MI 48332  
 810.732.8732 ext. 810.732.8705 fax  
 www.aecomfl.com

REGISTRATION

ISSUE/REVISION

| NO. | DATE      | DESCRIPTION             |
|-----|-----------|-------------------------|
| 1   | 10/1/2013 | ISSUED FOR CONSTRUCTION |

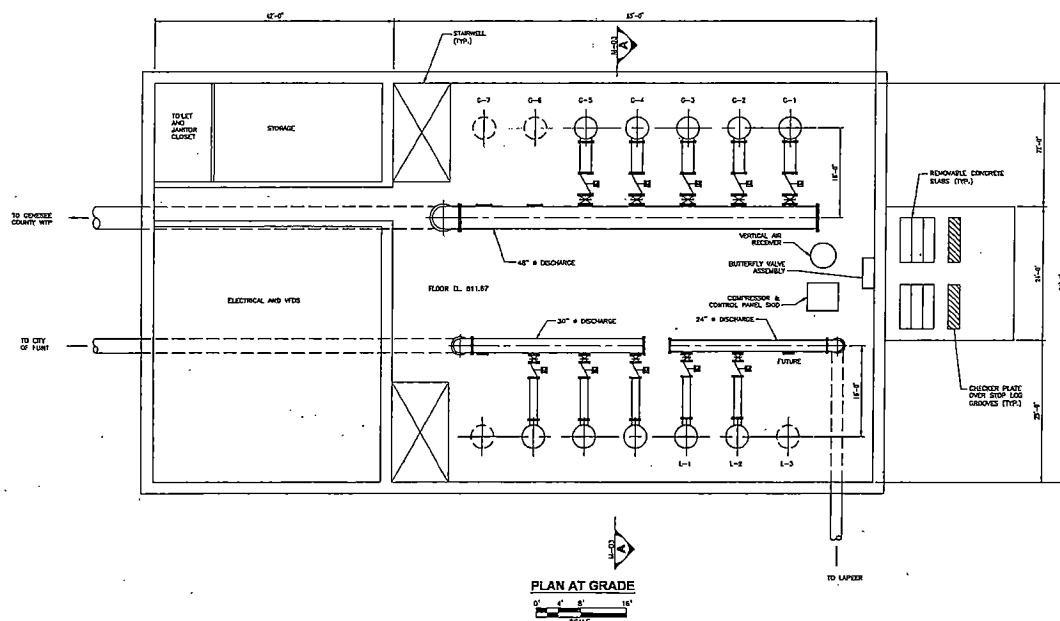
KEY PLAN

PROJECT NUMBER  
 00281334

SHEET TITLE  
 RAW WATER PUMP STATION  
 PLAN AT EL. 794.0

SHEET NUMBER  
 1 OF 1

FIGURE 8



**PLAN AT GRADE**

0' 4' 8' 16'

SCALE



**PROJECT**  
**LAKE HURON**  
**WATER INITIATIVE**

**FACILITY NAME**  
 Facility Address Line 1  
 Facility Address Line 2

CLIENT  
GENESEE COUNTY  
DRAIN  
COMMISSIONER

**CONSULTANT**  
ARECOM  
63267 BEECHER ROAD  
FLINT, MI 48532  
810 732 6712 IN 810 732 6766 fax  
www.arecom.com

## REGISTRATION

## USE/REVISION

|    |            |             |
|----|------------|-------------|
|    |            |             |
|    |            |             |
|    |            |             |
| A  | YYYY-MM-DD |             |
| IN | DATE       | DESCRIPTION |

KEY PLAN

### KEY PLAN

PROJECT NUMBER

**FD-3013B**

**SHEET TITLE**  
**RAW WATER PUMP STATION**  
**PLAN AT GRADE**

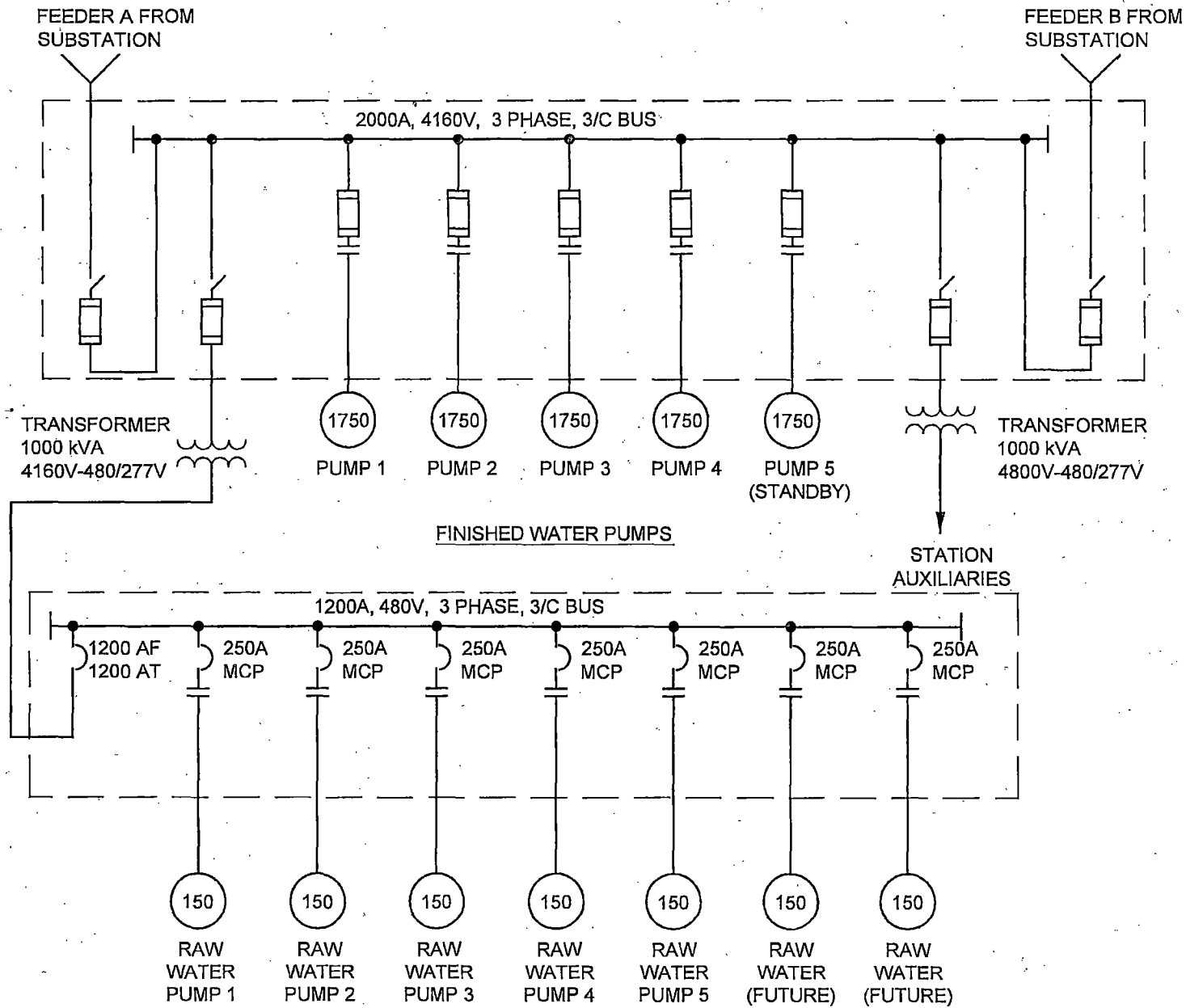
SHEET NUMBER

**FIGURE 1**

FIGURE 7

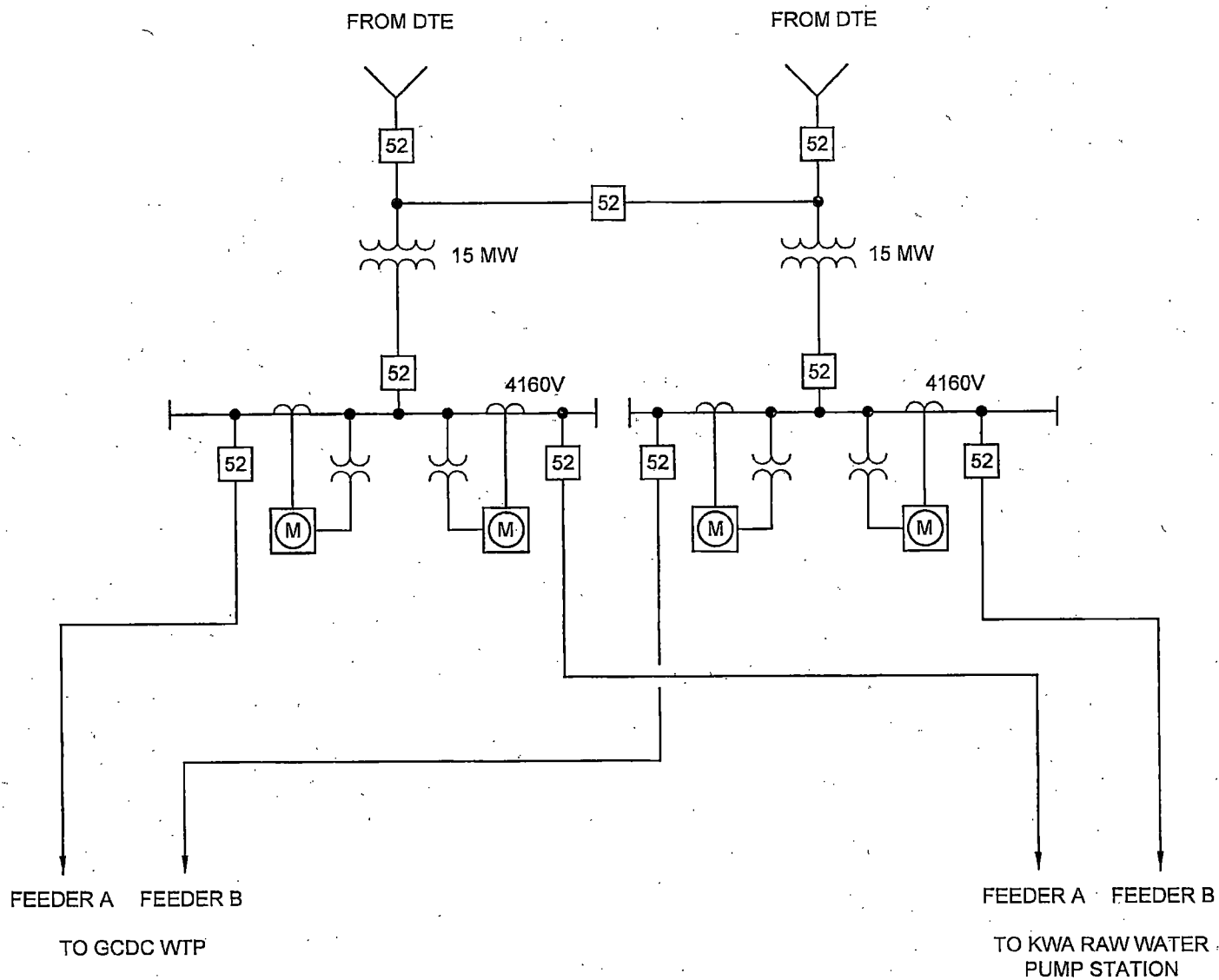
## **ELECTRICAL SINGLE LINE DIAGRAMS**

GCDC WATER TREATMENT PLANT  
SINGLE LINE DIAGRAM (E2)

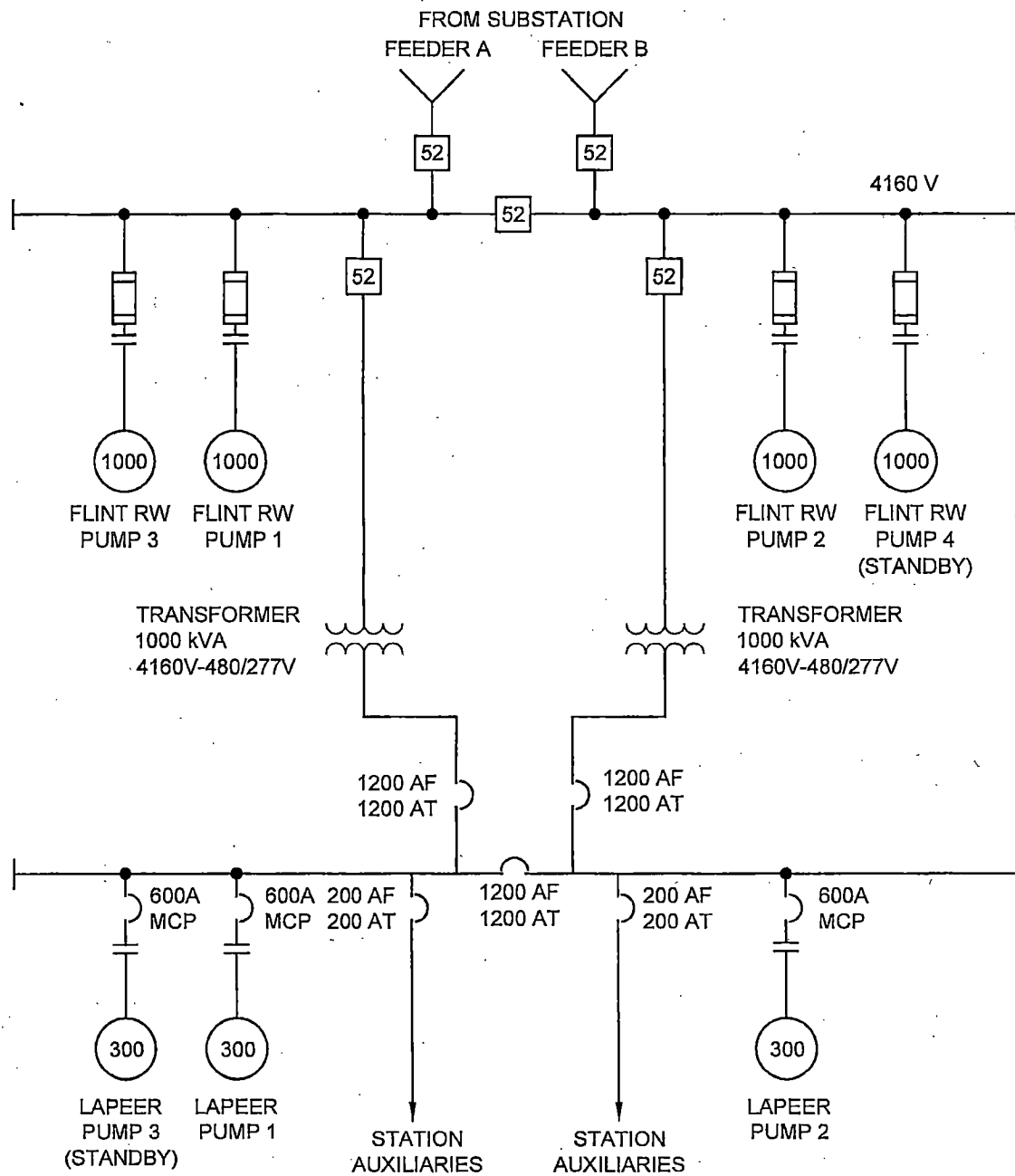


AECOM

ELECTRICAL SUBSTATION  
SINGLE LINE DIAGRAM (E1)



KWA RAW WATER PUMPING STATION  
SINGLE LINE DIAGRAM (E3)



AECOM

**APPENDIX A**  
**GEOTECHNICAL REPORT**





## Somat Engineering INCORPORATED

February 26, 2014  
2013217A

AECOM Technical Services of Michigan, Inc.  
G-3287 Beecher Road  
Flint, Michigan 48532

RE: DRAFT Report on Geotechnical Investigation  
Pump Station and Water Treatment Plant  
KWA Water Supply System  
Contract No. S5001  
Oregon Township, Lapeer County, Michigan

Dear Mr. Tharp:

We are in process of performing the geotechnical investigation for the proposed pump station and water treatment plant in Lapeer County. The investigation was divided into four (4) tasks; at this time we have completed Tasks 2, 3 and 4. This report presents the draft results of our observations, geotechnical recommendations, and construction considerations.

The soil samples collected during our field investigation will be retained in our laboratory for 60 days from the date of the final report, at which time these samples will be discarded unless otherwise directed by you.

Somat Engineering, Inc. is a full service geotechnical and construction/materials testing company. We would be pleased to be involved during the construction phase of this project and would welcome the opportunity to discuss any questions you may have regarding these services.

If you have any questions regarding this draft report, please do not hesitate to contact us. We anticipate updating this report to incorporate the results of Task 1 upon completion of the fieldwork.

Sincerely,  
**Somat Engineering, Inc.**

Jonathan D. Zaremski, P.E.  
Project Manager

JDZ/cjw

*Infrastructure Engineering Solutions*

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## DRAFT REPORT ON GEOTECHNICAL INVESTIGATION

PUMP STATION AND WATER TREATMENT PLANT  
KWA WATER SUPPLY SYSTEM  
OREGON TOWNSHIP, LAPEER COUNTY, MICHIGAN  
CONTRACT NO. S-5001

Owner:  
Karegnondi Water Authority

Prepared for:  
**AECOM**<sup>SM</sup>  
AECOM Technical Services of Michigan, Inc.  
G-3287 Beecher Road  
Flint, Michigan 48532

2013217A  
February 26, 2014



Somat Engineering,  
INCORPORATED

## REPORT SUMMARY

A general summary of the report conclusions and recommendations is provided below:

1. The project consists of the construction of a pump station and water treatment plant. The proposed area consists of a 73 acre parcel of land at the northeast corner of Marathon and Stanley Roads in Lapeer County, Michigan. This portion of the project and report addresses the geotechnical investigation for Contract S-5001. This project was divided into four (4) tasks by AECOM:
  - Task #1- North Reservoir Hydrogeologic Program
  - Task #2- North Reservoir Geotechnical Program
  - Task #3- Water Treatment Plant Building & Structures
  - Task #4- Water Main Investigation

**We have completed Tasks 2, 3 and 4. The report will be revised to incorporate the results and recommendations for Task 1 once completed.**

2. At this time, the project is in preliminary design stages. Therefore there is limited information about the geometry, structure layout, loading, or alignments.
3. No design information is provided for the North Reservoir. This section will be provided upon completion of the Task 1 fieldwork.
4. The inlet channel and reservoir will extend to elevation 765 feet (about 35 feet below proposed grade), and the wet well will extend to elevation 761 feet (about 39 feet below proposed grade). The floor slab for the structures is anticipated to be 2-feet thick. We anticipate the pump station and structures will be supported by shallow foundations or mat foundations. For the pump station and structures, we anticipate the soil encountered at the bearing elevations of 765 and 761 feet will be the medium dense to extremely dense clayey silty sand/clayey sandy silt; or very dense silty fine sand. We recommend a maximum net allowable soil bearing pressure of 4,500 psf for sustained gravity loading. This maximum net allowable bearing pressure incorporates a minimum factor of safety of 3.
5. We anticipate that during the construction of the pump station, an earth retention system will be required for the excavation. Based on the preliminary layout, the station is in close proximity with the existing Marathon Road. Recommendations are provided within the report. Possible artesian conditions were observed in several boring locations where the reported groundwater level just upon completion of drilling was higher than the depth at which it was encountered during the drilling. This was reported in fourteen (14) of the completed borings, where the groundwater did rise 0.5 to 4 feet from where first reported to the noted depths at completion of drilling. This possible artesian condition was reported in eight (8) of the completed borings, where the groundwater did rise 1 to 7.2 feet from where the groundwater was reported upon completion to the noted depths at 24 to 72 hours after completion of drilling.



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REPORT SUMMARY (CON'T)

6. We recommend special dewatering procedures be utilized because standard sump pit and pumping procedures will NOT be adequate. These special dewatering procedures could include but are not limited to downhole pumps in slotted casings, vacuum assisted wells or multiple stage wellpoints.
7. It is anticipated a 36-inch diameter pipe will be located on the north side of Stanley Road, and a 48-inch diameter pipe along the south side of Stanley Road. The design stage is very preliminary and there is no information on the proposed alignment of the pipe within the designated route or invert elevations. We anticipate the utility will be designed based on the soil borings from Task 3, S5001-B-27 to S5001-B-41; based on invert depth of 10 to 15 feet below existing grade. Generally, medium dense to extremely dense granular material and medium to hard silty clays were encountered and are considered suitable for supporting the proposed pipe utilizing standard bedding details, provided they are properly prepared and the existing natural soils are not significantly disturbed during construction.

The summary presented above is general in nature and should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned therein. Details of our findings and recommendations are discussed in the following sections and in the appendices of this report.

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Senior Staff Engineer

REPORT REVIEWED BY:

Jonathan D. Zaremski, P.E.  
Project Manager

Richard O. Anderson, P.E., Dist. M. ASCE  
Principal Engineer

**DRAFT REPORT ON GEOTECHNICAL INVESTIGATION  
PUMP STATION AND WATER TREATMENT PLANT  
KWA WATER SUPPLY SYSTEM  
OREGON TOWNSHIP, LAPEER COUNTY, MICHIGAN  
CONTRACT NO. S-5001**

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**DRAFT REPORT ON GEOTECHNICAL INVESTIGATION  
PUMP STATION AND WATER TREATMENT PLANT  
KWA WATER SUPPLY SYSTEM  
OREGON TOWNSHIP, LAPEER COUNTY, MICHIGAN  
CONTRACT NO. S-5001**

## **1.0 INTRODUCTION**

### **1.1 GENERAL**

Upon authorization from AECOM Technical Services of Michigan, Inc. (AECOM) of Flint, Michigan, Somat Engineering, Inc. (Somat) has conducted a geotechnical investigation for the proposed pump station and water treatment plant for the KWA Water Supply System at Stanley and Marathon Roads in Lapeer County, Michigan. The geotechnical investigation was performed in general accordance with Somat Proposal No. P130266, revised July 29, 2013 and modified per field conditions.

The following sections of this report will provide our understanding of the project, a description of our field investigation, the results of the field and laboratory tests, the logs of test borings, our interpretation of subsoil and groundwater conditions, and recommendations related to the geotechnical aspects of the proposed construction.

### **1.2 PROJECT INFORMATION**

The project consists of the construction of a pump station and water treatment plant. The proposed project area consists of a 73 acre parcel of land at the northeast corner of Marathon and Stanley Roads in Lapeer County, Michigan. This portion of the project and report addresses the geotechnical investigation for Contract S-5001. This project was divided into four (4) tasks by AECOM:

1. Task #1- North Reservoir Hydrogeologic Program
2. Task #2- North Reservoir Geotechnical Program



3. Task #3- Water Treatment Plant Building & Structures
4. Task #4- Water Main Investigation

To date, and for the submittal of this interim report, we have completed Tasks 2, 3 and 4. The report will be revised to incorporate the results and recommendations for Task 1 once completed.

The design is in a preliminary stage at the time of writing this report. As such, information about the exact locations, alignments, depths and loading of the proposed structures are not available. Based on the preliminary design drawings provided on November 19, 2013, the pump station will be approximately 700 foot by 500 foot in plan area. The pump station and treatment plant will service 30 million gallons per day (MGD) and include a reservoir for 150± million gallons (MG).

It is anticipated that finished site grades will be at elevation 800 feet. The inlet channel and reservoir will extend to elevation 765 feet (about 35 feet below proposed grade), and the wet well will extend to elevation 761 feet (about 39 feet below proposed grade). The floor slab for the structures is anticipated to be 2-feet thick.

The project also includes support utility and water main. It is anticipated a 36-inch diameter pipe will be located on the north side of Stanley Road, and a 48-inch diameter pipe along the south side of Stanley Road. Each utility will require a minimum of 5 foot of cover. We have based this report on the pipe inverts located at 10 to 15 feet below existing grade.

Somat performed a preliminary geotechnical investigation at this project location for AECOM in April 2013. The investigation consisted of four (4) soil borings extending to depths of 15 to 25 feet below existing grades. The existing report and data is included in Appendix K, and is referenced within this report text.





### 1.3 SITE CONDITIONS

Stanley and Marathon Roads are gravel surfaced adjacent to the proposed water treatment plant parcel. Stanley is paved between Marathon and German Road, which is west of the parcel. The land is owned by Genesee County Drain Commissioner, Division of Water and Waste Services (GCDC-WWS); however there are two properties adjacent to the parcel at the south and east sides, which are occupied by single family residences. No work was performed within the private properties. The county-owned parcel is currently a vacant field, previously used as cultivated land.

At the northeast corner of the parcel there is a wooded area. Site clearing was performed to allow access for the drill rig to three (3) soil boring locations within the wooded area. Per the direction of AECOM, these soil borings were re-located to allow for a 20 foot wooded area buffer along the north and east portion of the site, adjacent to the private properties.

Based on the surveying information provided for the soil borings, it appears that the ground surface elevation of the parcel range between 793 and 868 feet, sloping down from the west to the east. The ground surface elevations within the project limits along Marathon Road range from 796 to 803 feet, and the elevation along Stanley Road range from 796 to 821 feet.

### 1.4 NAMING CONVENTION FOR THE SOIL BORINGS

Per the request of AECOM, the soil borings were named S5001-B-01 through S5001-B-41. The "S5001" prefix represents Contract S-5001. The "B-###" indicates "B" for soil boring and the last two digits are the serial number of the borings. The pavement cores are designated as S5001-Core-1 to S5001-Core-5; utilizing the same prefix for the contract number, "Core" to indicate pavement core, and the last digit is the serial number of the core.



## 1.5 GEOLOGY OF LAPEER COUNTY

The surficial geology of Lapeer County is the direct result of the glacial deposits of the Wisconsin stage of Glaciations. Below the unconsolidated overburden, the bedrock is comprised of various strata of sedimentary deposits.

Quaternary geology refers to materials deposited by continental glaciers while bedrock geology relates to sedimentary rocks underlying the glacial deposits. The description below was derived through quaternary and bedrock maps and general summaries of Michigan geology prepared by the Michigan Department of Environmental Quality (MDEQ). The quaternary (surface) geology of Michigan developed during the Pleistocene age, Wisconsin Stage, as a result of glacial action.

The Michigan Department of Natural Resources (MDNR) Division of Geology classifies the majority of Lapeer County bedrock as "Lower Mississippian" limestones, shales, and sandstones. The bedrock in most of the northwest part of the county is classified as "Upper Mississippian". The remainder of the county is generally classified as "Pennsylvanian" limestones, shales, and sandstones.

The Quaternary Geology profile of Lapeer County prepared by the MDNR generally indicates locations of glacial outwash and gravel deposits near the ground surface. Glacial ponds occur in Rich Township, till plains and moraines exist in Burlington and Burnside Townships, and low areas of glacial lake deposits appear in Goodland, Imlay, and Almont Townships. A particular combination of sand and gravel resulting from a junction of outwash, moraine, and glacial lake deposits has resulted in a substantial deposit of commercial grade sand and gravel being located in the Lum Goodland area:

This material produced by the direct action of the ice is characteristically unsorted so that the grain size characteristics of the soils can vary widely within a small horizontal or vertical distance. This glacial till material predominates in southeastern Michigan. It is very common to find seams or layers of granular soil (silt, sand, or gravel) in the till, or seams and layers of



clayey material within a predominately granular material. In some areas of Lapeer County, where glacial meltwaters had the opportunity to sort the soil, commercial deposits of sand and gravel can be encountered. These deposits are usually easily recognized and have long been mined for the sand and gravel.

## 2.0 SUBSURFACE INVESTIGATION

### 2.1 FIELD EXPLORATION

The planned field exploration program consisted of performing a total of forty-one (41) soil borings and five (5) cores. The planned total lineal feet of drilling was 2,195 feet. The borings are divided up into the tasks as follows:

| Table 2.1<br>Summary of Fieldwork Performed for each Task  |                                                                                     |                                                         |
|------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------|
| Task                                                       | Boring Numbers                                                                      | Approximate<br>Quantities & Depths                      |
| Task #1- North Reservoir<br>Hydrogeologic Program          | S5001-B-01,<br>S5001-B-02,<br>S5001-B-06 to S5001-B-08,<br>S5001-B-10 to S5001-B-12 | 6 borings to 90 ft<br>2 borings to 75 ft                |
| Task #2- North Reservoir<br>Geotechnical Program           | S5001-B-03 to S5001-B-05,<br>S5001-B-09,<br>S5001-B-13 to S5001-B-15                | 6 borings to 90'<br>1 boring to 50'                     |
| Task #3- Water Treatment Plant<br>Building<br>& Structures | S5001-B-16 to S5001-B-26                                                            | 5 borings to 50'<br>5 borings to 40'<br>1 boring to 90' |
| Task #4- Water Main Investigation                          | S5001-B-27 to S5001-B-41,<br>S5001-Core 1 to S5001-Core-5                           | 15 borings to 25'                                       |

To date we have completed the thirty three (33) borings for Tasks 2, 3 and 4.

The locations of the borings were selected by AECOM, and staked by Somat utilizing handheld GPS, taking into consideration the locations of the utilities (underground and overhead). Ground surface elevations and coordinates were obtained by AECOM and were provided to Somat for use in this geotechnical investigation report. Due to the accuracy of the GPS unit ( $\pm 15$  feet), the



ground surface elevations were rounded to the nearest foot. A soil boring location diagram is presented in Appendix A.

The field sampling and drilling was modified in the field upon agreement between the Somat and AECOM field representative, based on the conditions encountered.

### 2.1.1 Drilling Operations

The drilling operations for Tasks 2, 3 and 4 were performed on various days between November 23, 2013 and February 4, 2014. The borings were drilled using 2¼-inch diameter solid stem augers and 2½ -inch and 3¼-inch or 4 ¼-inch diameter hollow stem augers. Deep borings were drilled with wash rotary methods of drilling using 2⅝-inch and 3⅝-inch rotary bits. Where possible, the borings were left open overnight to obtain a 24 hour groundwater reading. Upon completion, the borings in Task 4 were backfilled with cuttings, and the remaining borings were backfilled with grout. Where applicable the surface was patched with asphalt. The logs of soil borings are included in Appendix B. A summary of the field investigation is provided in Appendix C.

### 2.1.2 Sampling

Soil samples collected during the drilling portion of the subsoil exploration were labeled with the soil boring designation and a unique sample number. The samples were obtained at a regular interval of 2½ feet to a depth of 10 feet below grade and at an interval of 5 feet thereafter to the exploration depth of the borings. Note at some borings, sampling was performed at intervals of 5 feet in the first 10 feet of drilling and intervals of 2½ sampling was performed from 15 feet to 40 feet below existing grade. The samples were sealed in glass jars in the field to protect the soil and maintain the soil's natural moisture content.

All soil samples were transported to Somat's laboratory for further analysis and testing; with the exception of select samples provided to AECOM for testing. The summary of samples provided to AECOM for testing is included in Appendix D. Selected soil samples were sent to RTI



laboratory in Livonia, Michigan for specific chemical analyses under chain-of-custody protocol as detailed in Section 2.3.

The soil samples (other than the ones sent to AECOM or the chemical lab) will be retained in our lab for a period of 60 days from the date of the final report and will then be disposed of unless directed otherwise.

#### **2.1.2.1 Standard Penetration Test (SPT)**

Soil samples from the borings were recovered using split-spoon sampling procedures in general accordance with ASTM Standard D-1586 (Standard Method for Penetration Tests and Split Barrel Sampling of Soils). Soil boring samples were obtained by Standard Penetration Tests in general accordance with ASTM D-1586 procedures, whereby a conventional 2-inch O.D. split-spoon sampler is driven into the soil with a 140 pound hammer repeatedly dropped through a free-fall distance of 30 inches. The sampler is generally driven three successive 6-inch increments, with the blows for each 6-inch increment being recorded. The number of blows required to advance the sampler through 12 inches after an initial penetration of 6 inches, is termed the Standard Penetration Test resistance (N-value) and is presented graphically on the individual Logs of Test Borings. As added information, the number of blows for each 6-inch increment are also presented on the boring logs.

#### **2.1.2.2 Undisturbed Sampling**

As some boring locations, 3-inch diameter Shelby tubes were obtained in place of some split spoons. The Shelby tube was collected by use of the direct push method, per ASTM D-1587 (Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes).

#### **2.1.2.3 Bulk Sampling**

Bulk samples will be collected at six (6) soil borings. At this time two borings were completed with bulk samples collected as part of Task 2. These bulk samples were collected in a 5 gallon bucket, and included one (1) glass jar of sample to maintain moisture content. Two (2) bulk



samples were obtained per boring, at interval of 0 to 15 feet depth, and interval of 20 to 40 feet depth. The bulk samples were collected from the auger cuttings, or they were collected from additional split-spoon sampling. All bulk samples were submitted to AECOM for testing, and are listed in Appendix D.

Note that in order to obtain a larger quantity of sample, a 3-inch diameter split-spoon driven 24-inches with a 140 pound hammer repeatedly dropped through a free-fall distance of 30 inches was utilized at some depths for the purpose of bulk sampling. The size of the sampler is not standard per the ASTM D1586, therefore the blow counts and N-value were not included on the soil boring logs. The observed blow counts from the larger split spoon are included in Appendix E.

### **2.1.3 Groundwater Level Observation Procedures**

Whenever possible, groundwater level observations were made during the drilling operations and immediately after completion of drilling, and are shown on the individual Logs of Test Borings. Where possible, the borings were left open overnight to obtain a groundwater reading at 24 hours. During drilling, the depth at which free water was observed, where drill cuttings became saturated or where saturated samples were collected, was indicated as the groundwater level during drilling. In granular, pervious soils, the indicated water levels are considered relatively reliable when solid or hollow-stem augers are used for drilling. However, in cohesive soils, groundwater observations are not necessarily indicative of the static water table due to the low permeability rates of the soils, and due to the sealing off of natural paths of groundwater flow during drilling operations. A summary of the observed groundwater during drilling is included in Appendix E.

To obtain longer term groundwater monitoring readings, eight monitoring wells will be installed as part of Task 1. Once completed, the results will be added to Appendix G and H for monitoring well installation logs and records.



## 2.2 GEOTECHNICAL LABORATORY TESTING

All samples were classified in general accordance with the Unified Soil Classification System. Representative soil samples were subjected to laboratory tests consisting of moisture content determinations, Torvane tests, unconfined compressive strength, hand penetrometer, Loss On Ignition (LOI) tests and grain size and hydrometer analyses. Results are included on the respective logs of test borings in Appendix B.

In the Torvane test, the shear strength of a cohesive soil sample is estimated by measuring the resistance of the sample in shear when twisting a small, calibrated spring-loaded vane pressed into the sample.

The unconfined compression test consists of axially loading a small cylindrical soil sample at a slow rate of strain, until failure occurs. Failure is defined as the maximum stress level in the soil sample or the stress level at 15 percent strain, whichever is less.

In the hand penetrometer test, the shear strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small, calibrated spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square foot.

Standard Test Methods for Loss on Ignition (LOI) of Solid Combustion Residues were performed according to ASTM D7348 on soil samples suspected to contain organics. The soil sample is super-heated as a means to burn off all present organic matter and the percentage of organic matter is then calculated.

All laboratory tests were performed in general accordance with applicable ASTM procedures.

## 2.3 CHEMICAL TESTING

Soil samples were sent to RTI laboratory in Livonia, Michigan for specific chemical analyses under chain-of-custody protocol. Each soil sample was tested for the following chemical tests:



- Conductivity (measured in mmhos),
- moisture content (percent),
- pH,
- Chloride ion content (ppm),
- sulfide ion content (ppm),
- sulfate ion content (ppm).

It was requested by AECOM that five (5) soil borings include samples for corrosion testing, to a maximum depth of 25 feet below grade. As such, each boring tested included a sample from three (3) depths at 15 feet, 20 feet and 25 feet below grade; for a total of fifteen (15) samples tested. The results of the testing are included in Appendix I. A summary table of the samples depths and identification numbers is also presented in Appendix I.

#### 2.4 LIMITATIONS

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on, below or around this site. This investigation was strictly geotechnical and did not include any environmental investigation other than the chemical testing referenced above.

Further, SOMAT has made no observations or recommendations with regard to the presence or absence of mold or other biological contaminants (such as spores, fungi, bacteria, viruses and the byproducts of such organisms), now or in the future, on this site or within or on any structures to be constructed on this site. Any consideration with regard to the presence of mold, or the possibility of mold growth in or on the structure to be constructed on this site are not within SOMAT's scope of services on this project.





### **3.0 SUBSURFACE CONDITIONS**

#### **3.1 SOIL STRATIFICATION AND GROUNDWATER CONDITIONS**

Soil conditions encountered at the test boring locations have been evaluated and are presented in the form of Logs of Test Borings. The Logs of Test Borings presented in Appendix B include approximate soil stratification with detailed soil descriptions and selected physical properties for each stratum encountered in the test borings. In addition to the observed subsoil stratigraphy, the boring logs present information relating to sample data, Standard Penetration Test results, groundwater level conditions observed in the boring, personnel involved, and other pertinent data. For information, and to aid in understanding the data as presented on the boring logs, General Notes defining nomenclature used in soil descriptions are presented immediately following the Logs of Test Borings in Appendix B. It should be noted that the Logs of Test Borings included with this report have been prepared on the basis of laboratory classifications as well as field observations and logs of the soils encountered.

Please refer to the boring logs for the soil conditions at the specific boring locations. The Logs of Soil Borings are presented in Appendix B and the Soil Boring Location Diagrams are presented in Appendix A. It is emphasized that the stratification lines shown on the Logs of Test Borings are approximate indications of change from one soil type to another at the locations of the boreholes. The actual transition from one stratum to the next may be gradual, and may vary within the area represented by the test boring.

A generalized description of the soils encountered in borings is presented below for each task:

##### **3.1.1 Task #1 - North Reservoir Hydrogeologic Program**

A generalized description of the soils encountered in borings S5001-B-01, S5001-B-02, S5001-B-06 to S5001-B-08, S5001-B-10 to S5001-B-12 (located on the east section of the vacant parcel at the northeast corner of Stanley and Marathon) will be provided upon completion of drilling.



### 3.1.2 Task #2- North Reservoir Geotechnical Program

A generalized description of the soils encountered in borings S5001-B-03 to S5001-B-05, S5001-B-09, S5001-B-13 to S5001-B-15 (located on the east section of the vacant parcel at the northeast corner of Stanley and Marathon) is provided below, beginning at the existing ground surface and proceeding downward:

#### **Stratum 1: Surface Material.**

➤ **Topsoil & Agriculture Tilled Soil:**

Topsoil/tilled soil was encountered at the surface of soil borings S5001-B-03 to S5001-B-05, S5001-B-09, S5001-B-13 to S5001-B-15. The thickness of the topsoil/tilled soil ranged between 8 and 24 inches.

#### **Stratum 2: Fill.**

➤ **Sand Fill:**

Fill soils and possible fill soils consisting of sand, silty sand, or a mixture of these soils were encountered below the surface material in soil borings S5001-B-03, S5001-B-05, S5001-B-14, S5001-B-19. The fill soils extended to a depth ranging between 2.5 to 3.5 feet below grade (EL 831.5 to 802.5 feet).

#### **Stratum 3: Sand/Sandy Silt/Clayey Sand/Clayey Silt.**

➤ **Sand/Sandy Silt/Clayey Sand/Clayey Silt:**

Native soils consisting of sand/sandy silt/clayey sand/clayey silt were encountered in borings S5001-B-03, S5001-B-04, and S5001-B-09. The various granular layers extended to depths ranging between 8.5 to 14.5 feet below existing grade (EL 805.5 to 825 feet). The apparent density ranged from loose to medium dense.

#### **Stratum 4: Clay.**

➤ **Silty Clay:**

Native soils consisting of silty clay with clayey silt/sand seams and partings were encountered in soil borings S5001-B-03 to S5001-B-05, S5001-B-09, S5001-B-13 to S5001-B-15. The cohesive layers extended to depths ranging between 17.5 to 58 feet below existing grade (EL 771 to 795 feet). Boring S5001-B-03A terminated within this stratum at depth of 40 feet (EL 795 feet). The consistency of the cohesive soils ranged from medium to hard. Layers of silty sand and sandy silt were encountered within the clay layer in soil borings S5001-B-13 and S5001-B-14.

#### **Stratum 5: Silty Sand/Silt/Clayey Silt/Clayey Sand**

➤ **Silty Sand/Silt/Clayey Silt/Clayey Sand**

Native soils consisting of silty sand, clayey sand, sandy silt, or clayey sandy silt/silty sandy clay were encountered below the silty clay soils in borings S5001-B-



03 to S5001-B-05, S5001-B-09, S5001-B-13 to S5001-B-15. The material extended to the termination depth of the soil borings at depths of 40 to 90 feet (EL 715 to 745 feet). The apparent density of the cohesionless soils was medium dense to extremely dense. Generally the observed blow counts were 50 or greater beginning at depths ranging from 25 to 65 feet below existing grade (elevations 751 to 779 feet).

### 3.1.3 Task #3- Water Treatment Plant Building & Structures

A generalized description of the soils encountered in borings S5001-B-16 to S5001-B-26 (located on the west section of the vacant parcel at the northeast corner of Stanley and Marathon) is provided below, beginning at the existing ground surface and proceeding downward:

#### Stratum 1: Surface Material.

➤ Topsoil:

Topsoil was encountered at the surface of soil borings S5001-B-16 to S5001-B-26. The thickness of the topsoil ranged between 6 and 30 inches.

#### Stratum 2: Fill.

➤ Sand Fill:

Fill soils and possible fill soils consisting of sand, silty sand, or a mixture of these soils were encountered below the surface material in soil borings S5001-B-16, S5001-B-18 to S5001-B-21, S5001-B-23, S5001-B-25, and S5001-B-26. The fill soils extended to a depth ranging between 1.5 to 6 feet below grade (EL 788.5 to 801.5 feet). The apparent density of the fill/possible fill soils was loose to medium dense.

#### Stratum 3: Sand/Gravel.

➤ Sand:

Natural soils consisting of sand, silty sand, silty gravelly sand, or a mixture of these soils were encountered in soil borings S5001-B-18, S5001-B-21, S5001-B-23, and S5001-B-26. The sand soils extended to a depth ranging between 4.5 to 12 feet below grade (EL 788 to 796 feet). The apparent density of the sandy soils was loose to medium dense.

➤ Sandy Gravel:

Natural soils consisting of sandy gravel were encountered in soil boring S5001-B-20. The gravel soils extended to a depth of 11 feet below grade (EL 790 feet). The apparent density of the gravel soils was medium dense to very dense.

#### Stratum 4: Clay.

➤ Silty Clay:



Native soils consisting of silty sandy clay and silty clay with clayey silt/sand seams and partings were encountered in soil borings S5001-B-16 to S5001-B-22 and S5001-B-24 to S5001-B-26. The cohesive layers extended to depths ranging between 11 to 20 feet below existing grade (EL 781 to 788 feet). The consistency of the cohesive soils was stiff to hard.

Layers of silty sand, sandy silt and/or clayey silt were encountered within the clay layer in soil borings S5001-B-16, S5001-B-20, S5001-B-22, and S5001-B-25. The thickness of the layers ranged between 1.5 to 4 feet. These layers were encountered at a depth ranging between 5 to 12.5 feet (EL 792 to 798 feet) below existing grade. The apparent density of the sandy soils was medium dense to dense.

#### **Stratum 5: Sand/Silt.**

##### **➤ Silty Sand/Sandy Silt/Clayey Silt:**

Native soils consisting of silty sand, sandy silt, clayey silt, or a mixture of these soils were encountered below the cohesive soils in soil borings S5001-B-16, to S5001-B-20, S5001-B-23, S5001-B-24, and S5001-B-26. The cohesionless soils extended to depths ranging between 18 to 30 feet below existing grade (EL 771.0 to 782 feet). The apparent density of the cohesionless soils was medium dense to very dense.

Layers of sandy gravel were encountered in soil borings S5001-B-23 and S5001-B-26. The thickness of the layers ranged between 1 to 1.5 feet. These layers were encountered at a depth ranging between 18 to 25.5 feet (EL 773.5 to 775 feet) below existing grade. The apparent density of the sandy soils was medium dense to dense.

#### **Stratum 6: Clayey Silty Sand/Clayey Sandy Silt.**

##### **➤ Clayey Silty Sand/Clayey Sandy Silt:**

Native soils consisting of clayey silty sand /clayey sandy silt was encountered in soil all borings S5001-B-16 to S5001-B-26. The material extended to depths ranging between 40 to 90 feet below existing grade (EL 717 to 762 feet). All borings except S5001-B-26 terminated within this stratum. The apparent density ranged from medium dense to extremely dense.

### **3.1.4 Task #4- Water Main Investigation**

A generalized description of the soils encountered in borings S5001-B-27 to S5001-B-41 and cores S5001-Core 1 to S5001-Core-5 (located on Stanley Road from German Road to 1,800 feet east of Marathon Road and on Marathon Road from Stanley Road to 500 feet north of Stanley Road) is provided below, beginning at the existing ground surface and proceeding downward:



### **Stratum 1: Surface Material.**

- **Topsoil:**  
Topsoil was encountered at the surface of soil borings S5001-B-27, S5001-B-28, and S5001-B-29, which was performed in the vacant field. Topsoil was also encountered at the surface of soil boring S5001-B-41, which was performed on Stanley Road through the shoulder. The thickness of the topsoil was 8 to 18 inches.
- **Gravel Road Material:**  
Sandy gravel fill was encountered at the surface of soil borings S5001-B-30 and S5001-B-31, which was performed on Marathon Road through existing gravel shoulder. The thickness of the sandy gravel was 3 inches. Sandy gravel fill was also encountered at the surface of S5001-Core-5, which was performed on Stanley Road through existing gravel road. The thickness of the sandy gravel was 12 inches.
- **Asphalt:**  
Asphaltic cement concrete was encountered at the surface of soil borings S5001-B-32 to S5001-B-40 and cores S5001-Core-1 to S5001-Core-4, which was performed on Marathon and Stanley Roads through the existing asphalt shoulder/road. The thickness of the asphalt was 3 to 8 inches.

### **Stratum 2: Fill.**

- **Base Material:**  
Base material consisting of gravelly sand was encountered below the surface material in soil borings S5001-B-38 and S5001-B-40. The fill soils extended to a depth ranging between 1 to 2 feet below grade (EL 806.8 to EL 796 feet).
- **Sand Fill:**  
Fill soils and possible fill soils consisting of sand, silty sand, silty clayey sand, or a mixture of these soils were encountered below the surface material and base material when present in soil borings S5001-B-27, S5001-B-30 to S5001-B-41 and cores S5001-Core-1 to S5001-Core-4. The fill soils extended to a depth ranging between 2.5 to 10 feet below grade (EL 774 to 819 feet). The apparent density of the fill/possible fill soils was very loose to very dense.

A layer of silty sandy clay fill was encountered within the sandy fill layer in soil boring S5001-B-41. The thickness of the layer was 2.5 feet and was encountered at a depth between 4 to 5.5 feet (EL 793 to 791.5 feet) below existing grade. The consistency of the cohesive soils was stiff.

### **Stratum 3: Sand/Gravel/Silt.**

- **Sand:**  
Natural soils consisting of sand, clayey sand, silty sand, or a mixture of these soils were encountered in soil borings S5001-B-32, S5001-B-33, S5001-B-34, S5001-B-



35, S5001-B-36, and S5001-B-41. The sand soils extended to a depth ranging between 5 to 25 feet below grade (EL. 786 to 754 feet), reaching the termination depth of soil boring S5001-B-34. The apparent density of the sandy soils was medium dense to very dense.

Layers of clayey silt were encountered within the sand layer in S5001-B-38. The thickness of the layer ranged between 5 to 10.5 feet (EL 800 to EL 794.5 feet). The apparent density of the silt was medium dense.

➤ **Sandy Gravel:**

Natural soils consisting of sandy gravel were encountered in soil boring S5001-B-27. The gravel soils extended to a depth of 13 feet below grade (EL 787 feet). The apparent density of the gravel soils was medium dense to very dense.

➤ **Silt:**

Natural soils consisting of sandy silt were encountered in soil boring S5001-B-31. The silty soils were encountered between depths of 8 to 10 feet below grade (EL 798 to EL 796 feet). The apparent density of the silt soils was dense.

**Stratum 4: Clay.**

➤ **Silty Clay:**

Native soils consisting of silty sandy clay and silty clay with clayey silt/sand seams and partings were encountered in soil borings S5001-B-27 to S5001-B-33, S5001-B-35 to S5001-B-40. The cohesive layers extended to depths ranging between 8 to 25 feet below existing grade (EL 755 to 842 feet), reaching the termination depth of soil borings S5001-B-30, S5001-B-35, S5001-B-36, and S5001-B-37. The consistency of the cohesive soils was medium to hard.

Layers of sand, sandy silt, silty sand, clayey silt, or a mixture of these soils were encountered within the clay layer in soil borings S5001-B-28, S5001-B-30, S5001-B-36.

Layers of clayey silt were encountered alternating with the clay layer in S5001-B-39 and S5001-B-40 to a depth of 25 feet below existing grade at the termination depth of the borings (EL 772 to 783 feet). The thickness of the silt layers ranged between 1.5 to 5 feet. The apparent density of the silt ranged from loose to dense.

Alternating layers and seams of silty clay, silty sandy clay, silty sand, clayey sand and sandy silt were encountered in soil borings S5001-B-31 and S5001-B-41 below the upper layers and extended to 25 feet below existing grade at the termination depth of the borings (EL 781 to 777 feet).



**Stratum 5: Sand/Silt.**

➤ **Sand/Silty Sand/Sandy Silt/Clayey Silt:**

Native soils consisting of sand, silty sand, sandy silt, or a mixture of these soils were encountered below the cohesive soils in soil borings S5001-B-27, S5001-B-28, S5001-B-29, and S5001-B-33. The cohesionless soils extended to depths ranging between 16.5 to 25 feet below existing grade (EL 771 to 833.5 feet), reaching the termination depth of soil borings S5001-B-27, S5001-B-28, and S5001-B-33A. The apparent density of the cohesionless soils was medium dense to dense.

**Stratum 6: Alternating Layers of Sand and Clayey Silt/Sandy Silt.**

➤ **Clayey Silty Sand/Clayey Sandy Silt:**

Native soils consisting of sand, silty sand, alternating with layers of clayey silty sand and clayey sandy silt were encountered in soil borings S5001-B-29 and S5001-B-32. The cohesionless soils extended to a depth of 25 feet below existing grade at the termination of the borings (EL 770 to 825 feet). The apparent density of the cohesionless soils was dense to very dense.

**3.1.5 Generalized Soil Profiles**

To aid in evaluation of the existing soil data, we have provided generalized soil profiles along two cross sections of the site. One cross section is taken in the north-south direction, within the proposed pump station footprint. This was created utilizing soil borings predominately performed for Task 3. The second cross section is taken in the east-west direction across the site. This was created utilizing soil borings predominately performed for Tasks 2 and 3. The profiles and location diagram are included in Appendix J. The purpose of the profiles is to help identify the variability of the soil conditions observed in the borings across the site. For reference, we have added a line indicating the top of the very dense to extremely dense material (observed blow counts  $N \geq 50$ ).

**3.1.6 Existing Data from April 2013 Investigation**

Each of the four soil borings were drilled at great distances apart. However, the geotechnical conditions at the four boring locations were similar. Below the topsoil or tilled soil at the surface, we observed a layer of generally very stiff to hard silty or sandy clay that extended to a depth of about 13 to 18 feet below the ground surface. Below the near-surface clay, silt or fine sand was encountered to the extent of the borings at a depth of either 15 or 25 feet. The apparent density of the underlying sand was generally medium dense.



### 3.2 GROUNDWATER LEVEL OBSERVATIONS

During the drilling process, groundwater was encountered during drilling and/or upon completion of drilling in the majority of the soil borings and ranged generally between 1 and 15 feet in depth below existing grades. A summary table for the groundwater information is included in Appendix F.

Possible artesian conditions were observed in several boring locations where the reported groundwater level just upon completion of drilling was higher than the depth at which it was encountered during the drilling. This was reported in fourteen (14) of the completed borings, where the groundwater did rise 0.5 to 4 feet from where first reported to the noted depths at completion of drilling. This possible artesian condition was reported in eight (8) of the completed borings, where the groundwater did rise 1 to 7.2 feet from where the groundwater was reported upon completion to the noted depths at after 24 to 72 hours after completion of drilling.

We anticipate the long term groundwater table at the site ranges between 5 and 15 feet below existing grades (elevation 764 to 837 feet). The groundwater elevation will be better defined after the installation of the monitoring wells during Task 1. These results will then be included in the final report.

It should be noted that the elevation of the perched or natural groundwater table is likely to vary throughout the year depending on the amount of precipitation, runoff, evaporation and percolation in the area, as well as on the water level of surface water bodies in the vicinity affecting the groundwater flow pattern. Further, because of the time of year that this investigation was performed, observations of surficial features could not be made, though observations were made during the spring 2013 investigation and summarized below.

#### 3.2.1 Existing Groundwater Data from April 2013 Investigation

Groundwater was noted in all of the soil borings and its noted depth varied from the ground surface to a depth of about 18.5 feet below existing grade. At boring B-03, where the





groundwater was noted at the ground surface, it was observed that the surrounding ground surface had been graded to collect precipitation water, and the depression in the ground surface was doing precisely that. As such the surface water levels can be considered to be in a perched condition in the granular soils above the less permeable clay layer below. After a couple of hours, the groundwater in this borehole had stabilized at a depth of about 6 feet below the ground surface. Upon drilling completion, groundwater levels were observed at depths of about 6 to 7 feet below existing grade in borings B-02 and B-03. A groundwater level was not apparent in boring B-01 due to caving of the borehole.

A local resident, apparently a neighbor to this property, expressed to our Somat engineer that there were numerous artesian springs in the vicinity of this property. Near B-04, our engineer noticed a flowing small stream that was apparently emanating from a groundwater spring, thus indicating a potential artesian condition. Our borings indicated a similar condition, with rising water levels in the boreholes during drilling.

#### **4.0 ANALYSIS AND RECOMMENDATIONS**

The design is in a preliminary stage at the time of writing this report. As such, information about the exact locations, alignments, depths and loading is not available. Based on the preliminary design drawings provided on November 19, 2013, the pump station will be approximately 700 foot by 500 foot in plan area. The pump station and treatment plant will service 30 MGD and include a reservoir for 150± MG.

The project also includes support utilities and a water main. It is anticipated a 36-inch diameter pipe will be located on the north side of Stanley Road, and a 48-inch diameter pipe along the south side of Stanley Road. Each utility will require a minimum of 5 foot of cover. We have based this report on the pipe inverts located at 10 to 15 feet below existing grade.



#### **4.1 RECOMMENDATIONS FOR NORTH RESERVOIR (Task 1 and 2)**

No details were provided for the depth of the North Reservoir, therefore the recommendations will be provided upon completion of Task 1. We anticipate performing analysis and recommendations for bearing capacity, global stability of excavation, rapid drawdown, and construction considerations.

#### **4.2 RECOMMENDATIONS FOR WATER TREATMENT PLANT BUILDING AND STRUCTURES (Task 3)**

The proposed pump station will have a foot print area of approximately 700 feet by 500 feet. It is anticipated that finished site grade and finished floor will be at elevation 800 feet. The inlet channel and reservoir will extend to elevation 765 feet (about 35 feet below proposed grade), and the wet well will extend to elevation 761 feet (about 39 feet below proposed grade). The floor slab for the structures is anticipated to be 2-feet thick. The preliminary recommendations below are based on structures bearing at elevation 765 to 761 feet, and the results of the Task 3 soil borings; S5001-B-16 to S5001-B-26.

##### **4.2.1 Foundation Recommendations**

We anticipate the foundation slab will be situated between elevations 765 to 761 feet (about 35 to 39 feet below proposed site grade). The inlet channel and reservoir will extend to elevation 765 feet (about 35 feet below proposed grade), and the wet well will extend to elevation 761 feet (about 39 feet below proposed grade). The floor slab for the structures is anticipated to be 2-feet thick. We anticipate the pump station and structures will be supported by shallow foundations or mat foundations.

Based on the soil conditions encountered in soil boring S5001-B-16 to S5001-B-26, Clayey Silty Sand/Clayey Sandy Silt was encountered at depths ranging from 19.5 to 35 feet below grade, with an apparent density of medium dense to extremely dense. Above this material, the borings indicate various layers of sand, silt, and clay soils. We anticipate the soil encountered at the bearing



elevations of 765 and 761 feet will be the medium dense to extremely dense clayey silty sand/clayey sandy silt; or very dense silty fine sand. Due to the large amounts of fines, we recommend a granular engineered fill be placed below the footings or slab to allow for drainage.

For a foundation bearing on medium dense to extremely dense clayey silty sand/clayey sandy silt; or very dense silty fine sand between elevations 765 and 761 feet, we recommend a maximum net allowable soil bearing pressure of 4,500 psf for sustained gravity loading. This maximum net allowable bearing pressure incorporates a minimum factor of safety of 3 on the ultimate bearing capacity.

For bearing capacity and settlement considerations, isolated spread footing type foundations should be at least 30 inches wide, and continuous strip foundations should be at least 18 inches wide.

It has been our experience when constructing foundations on this dense sand, that the sand will become disturbed as soon as it is exposed. Because the sand is so dense, it will relax and "fluff" as the overburden soil is removed. The contractor will need to apply significant water to the sand and then re-compact it with a vibratory hoe-pack or similar piece of equipment. This will entail significant extra work on the part of the contractor and they should be aware of this via the project plans and specifications.

If any of these assumptions are not accurate, we should be consulted to assess the bearing capacity. This estimate is based on the anticipated loading, available soil boring information, and the assumption that the bearing soils will be re-compacted as necessary.

The load influence area for new foundations should be considered to extend down and out from the edges of the foundations on a 1V:1H slope. Therefore, new foundations constructed at different elevations should be placed so that their influence areas do not overlap.



#### **4.2.2 Foundation Recommendations – Anticipated Settlement**

Due to the nature of the project we anticipate that the net change in soil pressure for the inlet channel and reservoir, (new loading minus the weight of the soil removed), is likely to be negligible. Typically the weight of the soil removed from the excavation of 35 to 39 feet is more than the weight of the structure plus the contents. Given this condition, where the net applied pressure is less than existing, any settlement should be negligible. However, the design should also account for buoyant forces and uplift effects on the structure. These forces are typically resisted through the weight of the structure. If this is not sufficient, then other means of uplift resistance could be implemented, such as tension piles or widening or thickening the foundation mat to add weight to the structure.

A main concern with shallow foundations is the possibility of differential settlement between the adjacent structures within the treatment plant. Detailed loading would be required to analyze this. However, for the Task 3 soil borings, the N value blow counts below the proposed bearing elevation of 761 feet is generally ranging between 43 and 100. These dense to extremely dense soils are anticipated to have minimal settlement, especially considering the low "net" applied loads.

Any connections or piping that occur above the bearing elevation at 761 feet, should also be designed for differential settlement due to different bearing conditions. The soils above depth of 35 feet vary across the site and consist of either sand, silt, clay or a mixture of these soils. We recommend that a control joint be designed at the point where the two portions of the building or two adjacent structures or utilities meet. They will move differently and the resulting differential settlement will cause cracking in the structure at the junction of the structures at bearing elevations above elevation 765 feet.

#### **4.2.3 Bottom Heave**

Bottom heave will occur if an excavation extends too deep relative to the strength of the soil around and below the excavation. According to the soil conditions encountered at the borings



performed during Task 3; we do not anticipate bottom heave will be a problem for the construction of the pump station or structures. Our analysis was based on predominately medium dense to extremely dense granular soils encountered below the bearing elevations of 765 to 761 feet; with N values ranging from 43 to 100. We anticipate this excavation will have a factor of safety for bottom heave stability at or above the required value of 1.5.

#### **4.2.4 Lateral Earth Pressure Recommendations**

Below grade structures with unbalanced grade levels on opposite sides should be designed to account for the recommended lateral earth pressures summarized in the following table. The required lateral movement of the top of the wall to reach the earth pressure conditions are included below. The lateral earth pressures provided in the following table resulting from the medium to hard clay soils are assumed to be in-situ clay soils. Compacted clay backfill soils are not typically recommended as it is difficult to properly compact the clay, and to monitor placement of the clay. Compacted clay backfill results in very high lateral earth pressures which do not dissipate over time.



| Table 4.2.4<br>Recommended Lateral Earth Pressures (A, B, C) |                                                             |                   |          |                   |         |         |             |                |                |
|--------------------------------------------------------------|-------------------------------------------------------------|-------------------|----------|-------------------|---------|---------|-------------|----------------|----------------|
| Soil                                                         |                                                             | Sand <sup>a</sup> |          | Clay              |         |         | Random Fill | MDOT Class II  | MDOT 21AA      |
| Consistency                                                  |                                                             | Loose             | Dense    | Hard              | Stiff   | Soft    | —           | 100% ASTM D698 | 100% ASTM D698 |
| ACTIVE                                                       | Lateral Translation to Mobilize <sup>1</sup>                | (0.004)H          | (0.001)H | (0.01)H           | (0.02)H | (0.05)H | (0.02)H     | (0.002)H       | (0.001)H       |
|                                                              | Active Coefficient ( $K_a$ )                                | 0.32              | 0.28     | 0.45              | 0.45    | 0.45    | 0.60        | 0.31           | 0.22           |
|                                                              | Equivalent Fluid Active Earth Pressure <sup>2</sup>         | 40 psf            | 35 psf   | 65 psf            | 65 psf  | 65 psf  | 65 psf      | 40 psf         | 30 psf         |
|                                                              | Lateral Surcharge (q) Effect <sup>3</sup>                   | 0.32*q            | 0.28*q   | 0.45*q            | 0.45*q  | 0.45*q  | 0.60*q      | 0.31*q         | 0.22*q         |
| AT-REST                                                      | At-Rest Coefficient ( $K_0$ )                               | 0.48              | 0.44     | 0.63              | 0.67    | 0.75    | 0.75        | 0.47           | 0.36           |
|                                                              | Equivalent Fluid At-Rest Earth Pressure <sup>2</sup>        | 60 psf            | 55 psf   | 90 psf            | 90 psf  | 95 psf  | 95 psf      | 55 psf         | 50 psf         |
|                                                              | Lateral Surcharge (q) Effect <sup>3</sup>                   | 0.48*q            | 0.44*q   | 0.63*q            | 0.67*q  | 0.75*q  | 0.75*q      | 0.47*q         | 0.36*q         |
| PASSIVE                                                      | Passive Coefficient ( $K_p$ )                               | 3.12              | 3.64     | 2.20              | 2.00    | 1.67    | 1.67        | 3.25           | 4.60           |
|                                                              | Equivalent Fluid Passive Earth Pressure <sup>2</sup>        | 375 psf           | 440 psf  | 320 psf           | 270 psf | 210 psf | 220 psf     | 405 psf        | 640 psf        |
|                                                              | Lateral Bearing Capacity for Transient Loading <sup>4</sup> | —                 | —        | 6 x Clay Cohesion |         |         | —           | —              | —              |

Notes:

1. For active earth pressures, the structure must rotate about the base, with the top of the structure laterally translating between 0.001 and 0.05 of the exposed height to fully mobilize the active earth pressures. Otherwise the structure should be considered to be in an At-Rest condition.
2. Equivalent Fluid Earth Pressures should be applied in a triangular distribution laterally against the structure.
3. The lateral effect of a surcharge, q, on the ground surface at the top of the structure should be applied uniformly against the structure.
4. Passive pressures for long term loading conditions. For transient loads, i.e. wind or traffic loading, short term lateral loads will mobilize the cohesion in the clay soils and may be resisted by the "lateral bearing capacity" of the clay soils. However, long term or permanent lateral loads applied to the stiff to soft clays will cause the soils to creep and lose the horizontal resistance. Therefore, the lateral resistance from the clay soils for the life time of the structure will shift from the cohesive "lateral bearing capacity" to the equivalent fluid pressures as the pore water pressure dissipates.
- A. All earth pressures provided are for the drained condition. If drainage is not provided behind the structure or a soil strata is situated below the long term ground water table, then the equivalent earth pressures should be recalculated using the buoyant unit weight of the soil and include the hydrostatic pressure from the long term groundwater table.
- B. The recommended lateral earth pressures are unfactored. It is anticipated that the appropriate load and resistance factors will be applied during the design of the structure.
- C. Granular soils include sands, silts and gravels

The application of the earth pressures in the design of below grade structures will be influenced by the geometry of the structure, the fixity conditions imposed on the structure, the method and material used for construction and soil and groundwater conditions. Generally, the soil conditions acting on below grade structures can be assumed to be in one of the three conditions. Active earth pressure occurs when the top of the structure rotates away from the soil a sufficient amount to mobilize its shear strength (noted as the required lateral translation) so the soil mass



stretches horizontally and a condition of plastic equilibrium is reached. If the structure is rigidly restrained, so that it does not rotate sufficiently to reach the active earth pressure condition, at-rest earth pressure conditions will exist. If the structure is partially restrained, the actual lateral earth pressure may be somewhere between the active and at-rest pressure conditions. The actual pressure distribution will depend on the flexibility and stiffness of the structure. Also, any additional lateral structure loads resulting from surcharge loading, such as traffic loads, should be added to the above earth pressures. Passive earth pressure occurs when the wall or foundation moves into the soil and the soil mass is compressed horizontally, mobilizing its shear strength fully.

As noted, the recommended lateral earth pressures do not include a factor of safety, nor include hydrostatic pressures or account for the long term groundwater level. We anticipate that the necessary factors of safety will be indirectly applied to these recommended pressures through the load reduction factors applied in the structural design. Applying factors of safety to the above recommended pressures before their use in the design calculations would effectively double the safety reductions as these loads are carried through the design, unnecessarily penalizing the design.

The recommended lateral earth pressures are applicable for the design of standard cantilevered retaining structures or below grade walls. The design of braced retaining walls or flexible modular retaining walls require further analysis as the earth pressures developed are different for these wall systems. If these types of below grade structures or retaining walls are anticipated for this project, we would be pleased to assist in the design and provide updated lateral earth pressure recommendations.

Typically, for a pump station of this size and depth, the structure will be constructed within a temporary earth retention system (TERS), usually either a soldier pile and timber lagging wall or a steel sheet piling wall. The design of the TERS system is usually the responsibility of the contractor. Because of the depth of this pump station, the TERS system will need to be either



externally or internally braced, probably with at least 3 levels of bracing. We would be pleased to work with you on the conceptual plans for the TERS for your plans.

For cast-in-place below grade structures or other below grade structures requiring backfill behind the structure, the backfill should consist of granular engineered fill consistent with MDOT Class II gradation. To accurately apply the recommended earth pressures for the MDOT Class II granular fill, the backfill must extend out from the base of the structure at an angle of at least 45 and 60 degrees from the vertical for the active and passive cases, respectively. Precautions should be considered to avoid overstressing the structure during backfilling and compaction. Temporary bracing of the walls during backfilling may be required to help avoid this problem.

#### **4.2.5 Temporary Earth Retention Systems**

Excavations in existing fill soils and near surface granular soils, such as the ones expected at the project site are anticipated to be prone to caving and sloughing of the excavation sidewalls. Appropriate measures will be required to maintain the stability of excavation sidewalls. The required measures will depend on the depth and width of excavation and groundwater conditions at specific locations. In general, excavation walls should be sloped back to a stable angle in accordance with published MI-OSHA guidelines. If sufficient room is not available for sloping the excavation walls, shoring for the two shallow excavations will be required by means such as trench boxes, sliding trench shields or sheeting. Construction traffic, stockpiles of soil and construction materials should be kept away from the edges of the excavations for a distance equal to the depth of the excavation. If such clearances cannot be maintained, the resulting surcharge loads should be considered in the design of the shoring system. In all cases, MI-OSHA and other regulatory requirements must be followed and adequate protection provided for workers.





We anticipate that during the construction of the pump station, an earth retention system will be required for the excavation. Based on the preliminary layout, the station is in close proximity with the existing Marathon Road.

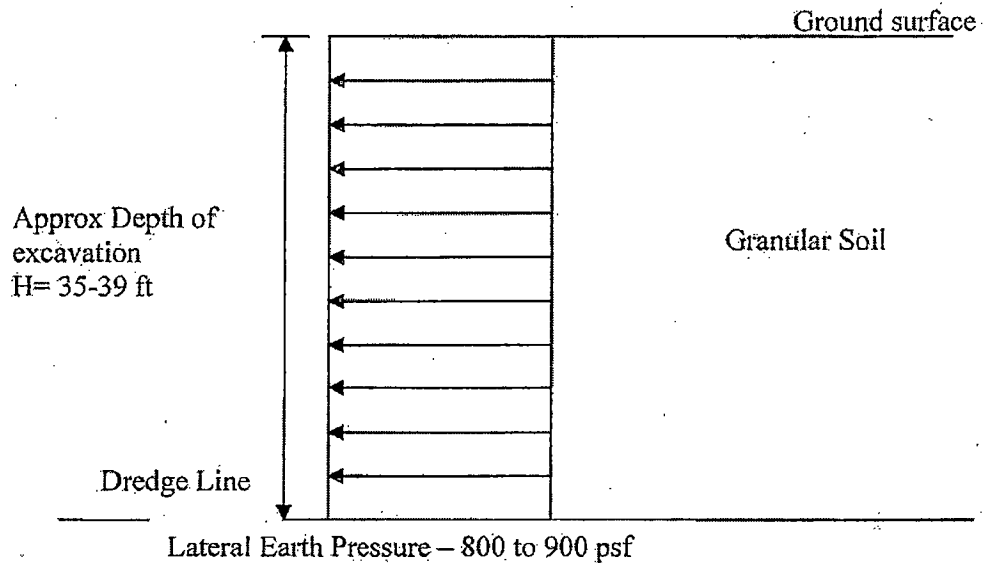
#### 4.2.5.1 Braced Excavations

A braced excavation will be required for excavations greater than about 15 feet or where the soil and groundwater conditions and adjacent surcharge loading preclude a cantilevered temporary earth retention design. We anticipate the excavation for the basement area of the proposed pump station will extend to a depth of 35 to 39 feet below grade requiring a braced excavation.

In general, the Contractor shall assume the design of braced excavations for these shafts would consist of a predominantly clay profile or a predominantly granular profile.

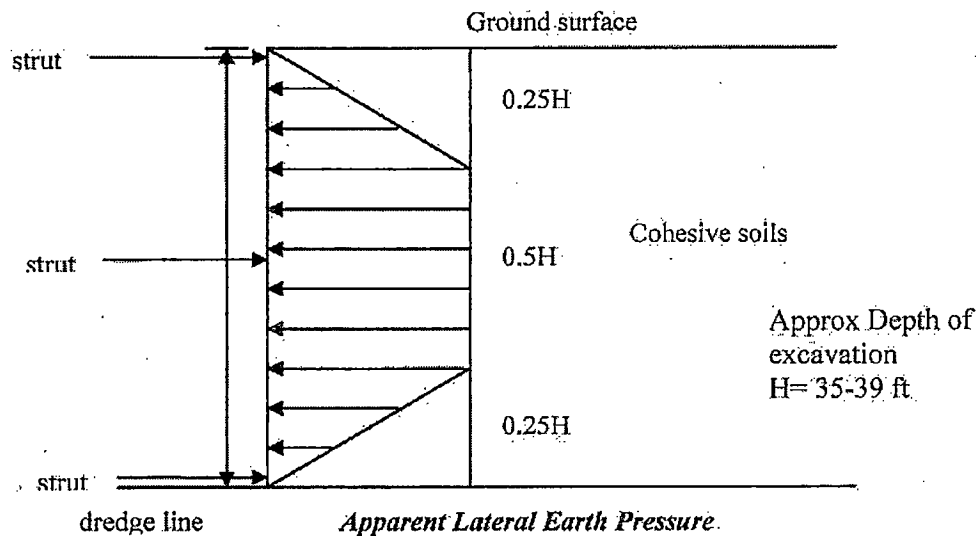
We anticipate the depth of the excavation will range between 35 and 39 feet below existing grades. For locations where there was a combination of clay and granular soils, we have conservatively assumed a predominantly granular profile. Based on this anticipated range of the depth of the excavation, the apparent lateral pressures for the strut design for the braced excavations for granular soils should range between 550 to 800 psf depending on the depth of the excavations. These values were calculated using methods outlined in NAVFAC DM -7.2 Section 4.0. The apparent lateral earth pressure for the strut design in predominantly sand soil profiles are presented by the following apparent lateral earth pressure diagram which represents  $\max = 0.65ka\gamma H$ :





Similarly, the apparent lateral pressures for the strut design for the braced excavations in predominately clay soils are represented by the following apparent earth pressure diagram, for "stiff clay profiles", where  $0.2\gamma H \leq p_{max} \leq 0.4\gamma H$ . Therefore the apparent lateral pressures for the strut design for the braced excavations for stiff clay soils should range between 875 to 2,000 psf depending on the depth of the excavations.





Lateral Earth Pressure – 875 to 2,000 psf

These diagrams include ultimate lateral earth pressures from the existing soil conditions. A uniformly distributed surcharge load of 360 psf (to account for construction and road traffic), as well as groundwater hydrostatic loading, will need to be included in addition to the recommended values.

The final design of any temporary earth support structures for excavations shall be performed by a Professional Engineer licensed in the state of Michigan and retained by the Contractor. The design shall also include calculation of the basal stability of the excavations to verify sufficiency of the factors of safety. The design shall be submitted to the Owner for review and acceptance.

#### 4.2.6 Groundwater Control

We anticipate the groundwater will be encountered approximately 5 to 15 feet below existing grades, or approximately elevation 764 to 837 feet; therefore the excavations for all structures and utility piping will be below the long term groundwater level. We anticipate standard sump pit and pumping techniques will not be sufficient to control the groundwater in the granular material. Therefore, special dewatering procedures or water mitigation procedures will be



required to control the groundwater. These special dewatering procedures could include, but are not limited to, downhole pumps in slotted casings or wellpoints. The loss of fines through dewatering should be carefully monitored to protect against the settlement of surrounding structures and utilities. The clay soils observed during drilling were interbedded with silt and sand soils, therefore we also anticipate this would allow groundwater infiltration within this material.

Dewatering will be required to provide and maintain stable bedding and bearing surface. Excavation stability may be compromised if these soils are not dewatered properly. In general, this site will be very difficult to dewater for deep excavations because of the presence of the fine sand and silt, and the interbedded nature of the soil profile. The potential contractors should be made explicitly aware of the difficulty anticipated in dewatering for the deep excavations, and the poor working conditions that will result if the soils are not dewatered prior to excavation. Special techniques are available to dewater these excavations, including vacuum wellpoints or eductors. Large diameter gravity deep wells are not likely to produce satisfactory results.

#### 4.2.7 Uplift

Since the pump station will extend below the estimated groundwater level at depth 5 to 15 feet below grade, the design of the structures must take into account the unbalanced hydrostatic pressure occurring when the pump station is completely dewatered prior to or after construction. Instability will occur if uplift pressure due to existing groundwater is larger than the combination of the structure and its mechanical contents. We recommend a minimum factor of safety of 1.25 be incorporated into the design.

Given our experience at the site, we recommend that the worst case groundwater level be assumed to be at the proposed ground surface of elevation 800 feet. This elevation may be refined based on the results of the groundwater monitoring program. With the anticipated pump station bearing at elevation 765 to 761 feet, an empty pump station condition may experience uplift forces of 2,500 psf at 40 feet below the groundwater table.



If the thickness of the mat foundation cannot be designed to accommodate the uplift, other methods can be used to resist the uplift forces. These methods include tension anchors, skin friction on the exterior perimeter of the concrete walls, shear studs and skin friction on the earth retention system, or extending the horizontal limits of the base slab beyond the perimeter of the shaft and using the weight of the backfill to resist the uplift. In addition, control of the maximum elevation of the groundwater table may be feasible by subsurface gravity drainage systems, if site grades permit, or by emergency pumping systems. We would be pleased to discuss these options with you and to provide you with the required geotechnical parameters should you need the additional uplift resistance.

#### **4.3 SEISMIC SITE CLASS RECOMMENDATION**

Based on the soil borings performed for this project and our experience with the overall soil conditions at this site, we would classify this site as Site Class D for stiff soil profile, as per the Michigan 2009 Building Code Table 1615.1.1. The soils encountered within the upper 90 feet of depth had average standard penetration resistance,  $N$  of less than 50. Note that select soil borings performed did have an average standard penetration resistance of  $N$  greater than 50; which is classified as Class C very dense soil; however due to the variability we recommend Class D.

#### **4.4 WATER MAIN INSTALLATION RECOMMENDATIONS-OPEN CUT METHOD (Task 4)**

It is anticipated a 36-inch diameter pipe will be located on the north side of Stanley Road, and a 48-inch diameter pipe along the south side of Stanley Road. Each utility will require a minimum of 5 foot of cover. The design stage is very preliminary and there is no information on the proposed alignment of the pipe within the designated route or invert elevations. We anticipate the utility will be designed based on the soil borings from Task 3, S5001-B-27 to S5001-B-41.



We anticipate the invert of the pipe in the open cut sections will be situated at a depth of about 10 feet to 15 feet below existing grade considering a cover thickness to the crown of the pipe to be a minimum of 5 feet. The following table summarizes the anticipated bearing soils at a depth ranging between 10 and 15 feet below existing grades.

| <b>Table 4.4</b><br><b>Summary of anticipated bearing soils for the open cut sections</b><br>Based on borings S5001-B-27 to S5001-B-41 |                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Road alignment</b>                                                                                                                  | <b>Anticipated bearing soils at a depth ranging between 10 and 15 feet below existing grade</b>                                                                                                                                                                                          |
| Stanley Road                                                                                                                           | Variable- Mixture of the following: <ul style="list-style-type: none"><li>• Very dense to medium dense sandy gravel</li><li>• Medium dense to very dense sandy silt/clayey sandy silt/clayey silt</li><li>• Loose silty sandy at S5001-B-36</li><li>• Stiff to hard silty clay</li></ul> |
| Marathon Road<br>S5001-B-30 to S5001-B-31                                                                                              | Variable- Mixture of the following: <ul style="list-style-type: none"><li>• Medium dense sandy silt</li><li>• Stiff to very stiff silty clay</li></ul>                                                                                                                                   |

Generally, medium dense to extremely dense granular material and medium to hard silty clays are considered suitable for supporting the proposed pipe utilizing standard bedding details, provided they are properly prepared and the existing natural soils are not significantly disturbed during construction. The following sections highlight areas where poor soils were encountered at the invert elevation or on top of the proposed pipe. Soil improvement is recommended at these locations as described below:

#### **Organics**

A sample of clayey sand with organics was encountered above the proposed crown elevation in boring S5001-B-36. An LOI test on sample SS3 at 7.5 ft depth had 9.8% organics. These soils should not be reused as backfill material.



### **Granular Bearing Soils in Loose Condition**

Silty sand soils were encountered at the invert depth of some of the soil borings along the proposed pipe alignment. Generally, the apparent density of these materials ranged from medium dense to very dense; however boring S5001-B-36 encountered loose silty sand within the anticipate invert depth of 10 to 15 feet. The apparent density of this bearing material is loose, which is not considered suitable for supporting the proposed pipe structure if left in its current condition. This material should be compacted adequately prior to placement of the new pipe.

Dewatering will be required prior to excavating to install the new pipe. With a properly operating dewatering system in place, it should be feasible to compact this material and hence avoiding having to undercut and replace with engineered fill which would increase the cost of this project. The same dewatering precautions apply to construction of these excavations as was noted in the previous section of this report.

#### **4.4.1 Bedding and Backfill Material Recommendations**

Proper bedding material will be required to provide a stable base for underground utility piping. The proposed pipe invert at some of the areas along the proposed alignment will consist of clay or silt, therefore, a minimum of 6 inches of clean granular fill should be placed to provide the required bedding. We recommend that all aggregate stabilization material and bedding material consist of a granular material, compatible in grain size with the natural surrounding soils. Alternatively, all aggregate stabilization material and bedding material which is not compatible with the grain size of the natural surrounding soils should be wrapped with a non-woven geotextile fabric to prevent the migration of the fine soil particles into the bedding aggregate.

The requirements for the bedding material, including the gradation of the material and its compaction requirements should be determined by the designer of the pipe. MDOT Class II/IIA granular soil is being used exclusively elsewhere on the overall project, and it would be suitable for use for this portion of the project. Whether the bedding material is shaped to conform to the



pipe, compacted or loose, is a design decision by the pipe designer. Specific requirements for the compaction of the backfill material under the haunches of the pipe should also be specified, as was done for the mainline water line.

Any subgrade soils that become disturbed during excavation will need to be undercut a minimum of 9 inches below the bottom of the bedding material and be replaced with an aggregate stabilization layer compacted in place. The required thickness of the aggregate stabilization layer could vary, and should be determined by the engineering inspector in the field at the time of construction. We recommend crushed aggregate, with a gradation of MDOT 21AA for this purpose. Finer grained standard bedding material will need to be placed on top of this stabilization layer, below the pipe. We recommend that open graded aggregate NOT be used as bedding material (without a geotextile separator fabric) or used as backfill below the long term groundwater level.

We understand the project corrosion consultant will provide specific requirements based on the chemical laboratory results of the soil samples. The following paragraph provides general recommendations for corrosion protection.

To minimize corrosion of buried metallic utilities, we recommend topsoil, organic soils, existing fill soils, and mixtures of sand and clay not be placed adjacent to buried metallic utilities. Rather, we suggest a clean sand be placed completely around buried metal piping. Also, buried utilities of different metallic construction should be electrically isolated from each other to minimize galvanic corrosion problems. For critical underground facilities, cathodic protection should be considered. We understand that the design of the cathodic protection system is being performed by another consultant for the project.

#### **4.4.2 Recommendations for the re-use of overburden soils as backfill material**

Most of the material encountered above the proposed pipe invert consists of a mixture of clay, sand and silt material with excessive amount of fines; therefore we find it unlikely that the





material will meet a standard gradation for granular backfill. The granular soils onsite were varied across the soil borings, therefore there was not a large layer or pocket of soils to be feasible to locate for use as backfill. We do not recommend using material containing organics as backfill material below paved or non paved roads. The backfill material should also be free of any debris.

If the site clay is used to backfill, (not under existing roads), then it should be compacted using a sheepsfoot roller. However, some drying would be required in order to arrive at suitable water content for compaction.

#### **4.4.3 Watermain Groundwater Considerations**

We anticipate the long term groundwater table at the site ranges between 5 and 15 feet below existing grades, or approximately elevation 764 to 837 feet. The groundwater elevation will be better defined after the installation of the monitoring wells during Task 1. These results will then be included in the final report. Possible artesian conditions were reported in fourteen (14) of the completed borings, where the groundwater did rise 0.5 to 4 feet from where first reported to the noted depths at completion of drilling. Although the roadway borings were not permitted to remain open over night, eight (8) of the completed borings observed the groundwater rise of 1 to 7.2 feet from where the groundwater was reported upon completion to the noted depths at after 24 to 72 hours after completion of drilling.

As such, based on the subsurface information we believe the long term groundwater table may be as high as 5 to 10 feet above the proposed invert depth of the pipe in the open- cut sections (assuming invert depth of 10 to 15 feet below grade). At this preliminary stage of the design, no information is available for the anticipated invert elevations. Water is also anticipated to flow into the excavation from granular bedding material of the adjacent utility trenches.



We recommend special dewatering procedures because standard sump pit and pumping procedures will NOT be adequate. These special dewatering procedures were discussed in the previous sections of this report.

The Contractor shall design the dewatering system, including the method of extracting the water from the soils. The piezometric head shall be drawn down by the dewatering system to a minimum of two (2) feet below the bottom of open cut excavations and three (3) feet below structure excavations. If groundwater is not adequately controlled, bottom instability of the excavation should be expected. If the groundwater is not lowered prior to constructing the excavation, the bottom of the trench may become unstable and extensive sloughing and caving will occur. Significant undercutting will then be required to achieve a stable bottom and potential settlement issues may arise at the ground surface.

Loss of fines should be carefully checked during dewatering operations at this site because of the fine gradation of the soils encountered in the soil borings. The loss of fines should be limited to no more than 5 ppm by volume in the extracted water. This should be periodically tested during the entire period of the dewatering operations. A significant amount of the overburden soils encountered in the borings consisted of clays and silt with varied frequencies of sand layers throughout. As such deep gravity wells will likely not be effective, and vacuum assisted stepped well point systems or eductor systems may be required. We recommend performing additional testing and grain size analyses to determine amount of anticipated fines, once the invert elevation is determined.

Based on this information, we believe proper and adequate dewatering systems will be critical for the success of the installation of this water main. We recommend a qualified and experienced Contractor with at least 5 years of experience perform the dewatering design and installation. The dewatering contractor must be aware of the excessive fines content of the soils to be dewatered and the potential of encountering artesian condition.



It must be noted that even though the soil profile at some borings appear to be predominantly clay, yet there are granular sand and silt seams through which the groundwater under artesian condition may flow through and into the excavation. Dewatering should be performed with care and sufficiently localized so as not to cause harmful settlements of nearby foundations, utilities or pavement.

In addition to the dewatering required to excavate the trench, there will also be dewatering required to lay the pipe. Depending on the contractor's dewatering system, and how long they let it run, the contractor may inadvertently construct a French drain that will bring water through the completed section of the pipe backfill to the working face of the pipe laying operation (tail water). Because this pipeline will not be a gravity line, but rather a pressurized line, some of this may be alleviated by the up's and down's of the vertical alignment of the pipe as it follows the ground contours. Unless there is a specific design reason to install bentonite barriers along the alignment of the pipe, the installation of bentonite barriers to control tail water flow should be left to the contractor's means and methods.

#### **4.4.4 Watermain Excavation Considerations**

Based on the soils and groundwater table information, we anticipate the sides of the water main excavations will be highly prone to caving and sloughing, especially in areas where the soil conditions are in a loose state ( $N$  value of 9 or less) or are not properly dewatered. The likelihood of excavation collapse in these soil conditions may also affect the ability of the contractor's personnel and equipment to safely work in close proximity to the edges of the tops of the excavations. The contractor should be aware of these conditions and should base his safety procedures and bid accordingly. Please see the discussion below for additional recommendations in this regard.

Appropriate measures will be required to maintain the stability of excavation sidewalls. These measures will likely involve methods and equipment beyond what would normally be required in excavations extending to these relatively shallow depths. The required measures will depend on



the depth and width of excavation and groundwater conditions at specific locations. In general, trench walls should be sloped back to a stable angle in accordance with published MI-OSHA guidelines. If sufficient room is not available for sloping the trench walls, which is likely the case in this area since the new water main is generally at the edge of the road right of way and adjacent to numerous other utilities, shoring will be required. The use of a shield or trench box can be used to protect workers from potential caving. Construction traffic, stockpiles of soil and construction materials should be kept away from the edges of the excavations for a distance equal to the depth of the excavation. If such clearances cannot be maintained, the resulting surcharge loads should be considered in the design of the shoring system. Likewise, loads from traffic on adjacent road areas also need to be considered in the design. In all cases, MI-OSHA and other regulatory requirements must be followed and adequate protection provided for workers.

Care should be exercised when excavating near existing pavement, utilities and structures that are to remain, to protect them from damage. The contractor should be aware of the existing utility locations before excavating and be prepared to support or brace them, as required.

#### **4.5 ENGINEERED FILL REQUIREMENTS**

Any fill placed below proposed structures or pavement areas should be an approved, engineered material, free of frozen soil, organics, or other deleterious material.

**Watermain/Piping:** Engineered fill should be spread in level layers, not exceeding 9 inches in loose thickness, and be compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with the MDOT Michigan Cone test, or ASTM D-698 (Standard Proctor). Below landscaped (unpaved) areas, the fill should be compacted to a minimum of 90 percent of the maximum dry density as determined in accordance with the MDOT Michigan Cone test, or ASTM D-698 (Standard Proctor). Fill should not be placed on frozen subgrades.



The compaction requirements for the bedding material and the backfill material surrounding the pipe are part of the design of the pipe and should be specified by the pipe designers.

**Structures:** Engineered fill placed for structures should be spread in level layers, not exceeding 9 inches in loose thickness, and be compacted to a minimum of 100 percent of the maximum dry density as determined in accordance with the MDOT Michigan Cone test, or ASTM D-698 (Standard Proctor).

Any existing fill materials should not be re-used for backfill. Backfill for the structures and utility trenches should consist of granular engineered fill. Soils containing greater than 4 percent organics are considered unsuitable for use as engineered backfill. Any clayey sand fill, clay fill and mixed sand and clay fill will be difficult to compact, and some drying would be required in order to arrive at a suitable water content for compaction. MDOT Class II/IIA sand will be used as backfill throughout the mainline portion of this project, and it is recommended that this material also be used on this site.

## 5.0 GENERAL QUALIFICATIONS

This report and the attached Logs of Test Borings are instruments of service, which have been prepared in accordance with generally accepted soil and foundation engineering practices. We make no other warranties either expressed or implied as to the professional advice included in this report.

The contents of this draft report have been prepared in order to aid in the evaluation of expected subsoil properties to assist the engineer in the design of this project. When the design details of the structures and the utility lines become known, this report will have to be revisited to reflect that new information. In the event that any changes are made in the geotechnically related aspects of the project, however slight, the conclusions and recommendations contained in this



report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified in writing by our office.

Since the information obtained from test borings is specific to the exact test boring locations, soil and water information could be different from those occurring at other locations of the site. This report does not reflect variations that may occur between the borings. The nature and extent of these variations may not become evident until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate the recommendations provided in this report.

The discussions and preliminary recommendations submitted in this report are based on the soil information contained in the Logs of Test Borings and test results appended to this report. We expect that the Logs of Test Borings included in this report along with our discussions and conclusions will assist you in designing the proposed structures. If you have any questions regarding this report, please contact us.



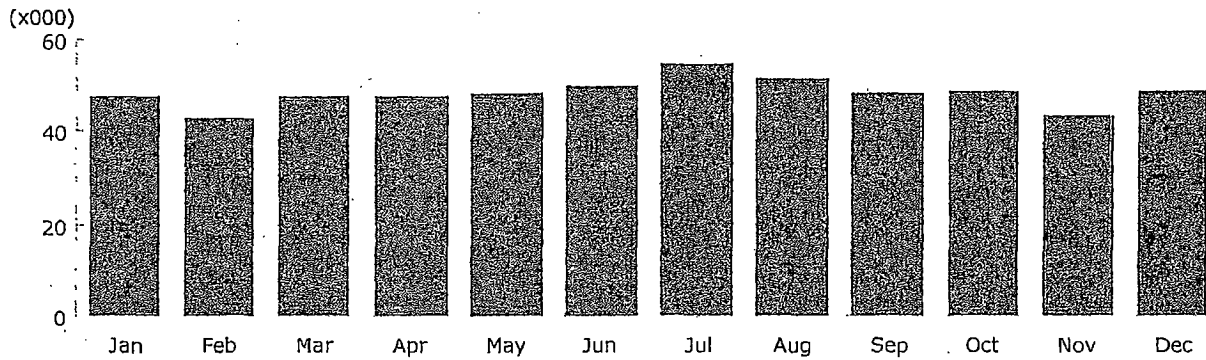
**APPENDIX B**  
**PRELIMINARY ENERGY COST ESTIMATE AND**  
**COMPARISON BETWEEN ELECTRIC AND PROPANE**

KAREGNONDI WATER PLANT  
PRELIMINARY ENERGY COST ESTIMATE AND COMPARISON OF  
ELECTRIC VERSUS PROPANE



ALMC DATA \$10.07/KWH HR

### Electric Consumption (kWh)

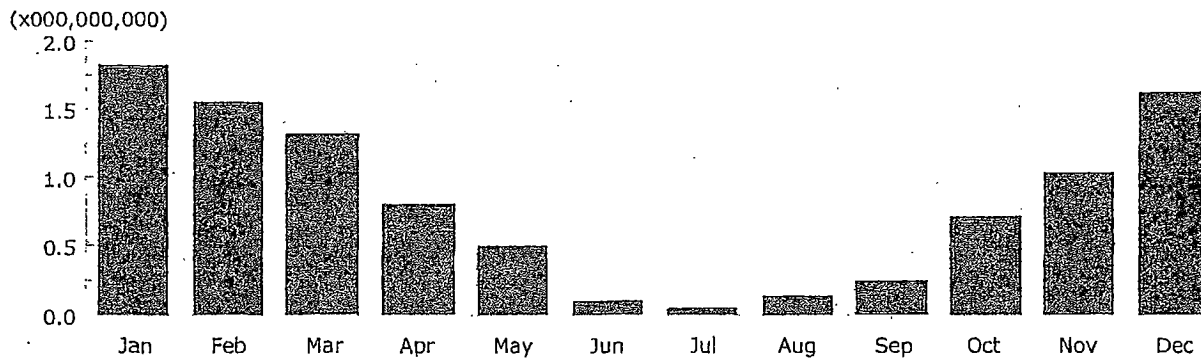


|        | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Oct   | Nov   | Dec   | Total  |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Run 1. | 47.44 | 42.93 | 47.55 | 47.69 | 48.26 | 49.94 | 54.58 | 51.34 | 48.31 | 48.70 | 43.38 | 48.55 | 578.66 |
| Run 2. |       |       |       |       |       |       |       |       |       |       |       |       |        |
| Run 3. |       |       |       |       |       |       |       |       |       |       |       |       |        |
| Run 4. |       |       |       |       |       |       |       |       |       |       |       |       |        |
| Run 5. |       |       |       |       |       |       |       |       |       |       |       |       |        |

1. Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:02)

GAS DATA (PROPANE) \$4.30/1000 BTU

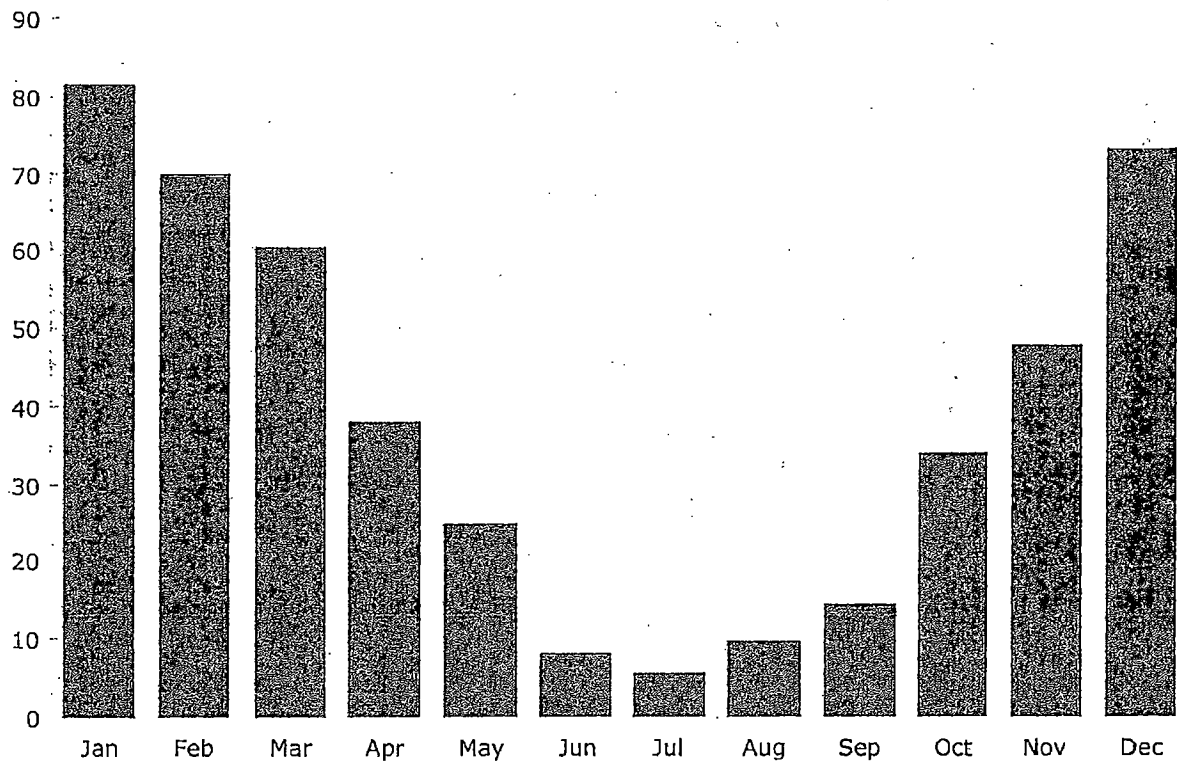
### Gas Consumption (Btu)



|        | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Total |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Run 1. | 1.82 | 1.55 | 1.33 | 0.81 | 0.50 | 0.11 | 0.05 | 0.14 | 0.26 | 0.71 | 1.04 | 1.62 | 9.94  |
| Run 2. |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Run 3. |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Run 4. |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Run 5. |      |      |      |      |      |      |      |      |      |      |      |      |       |

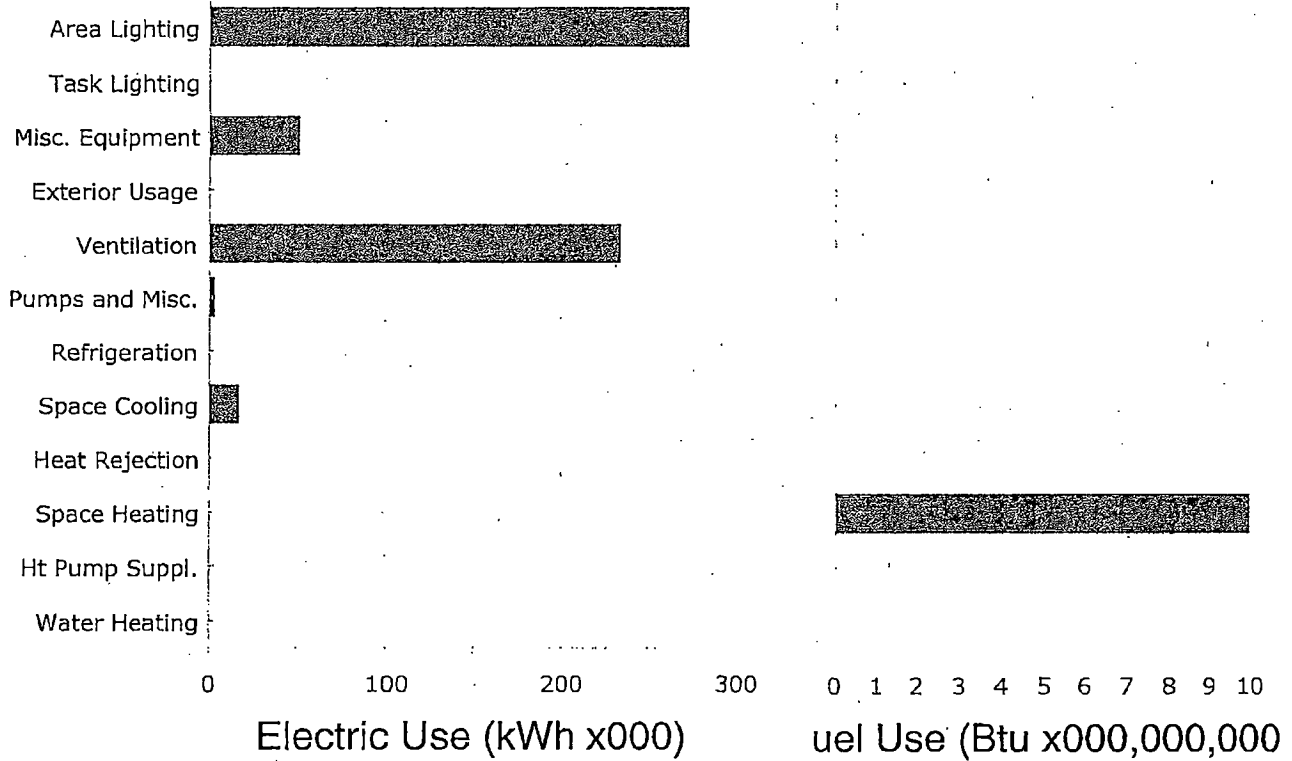
**Monthly Utility Bills (\$)**

(x000)

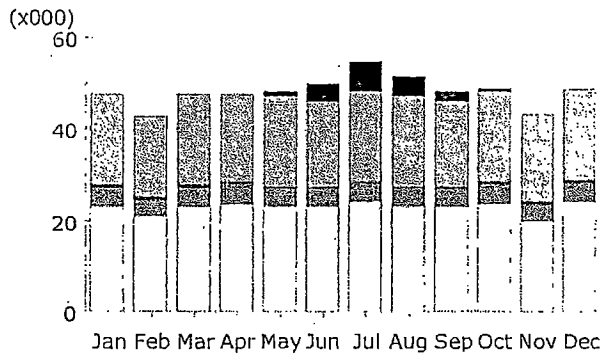
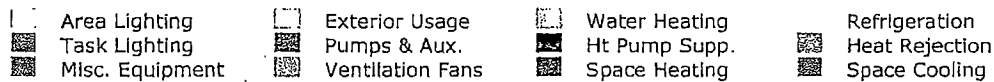
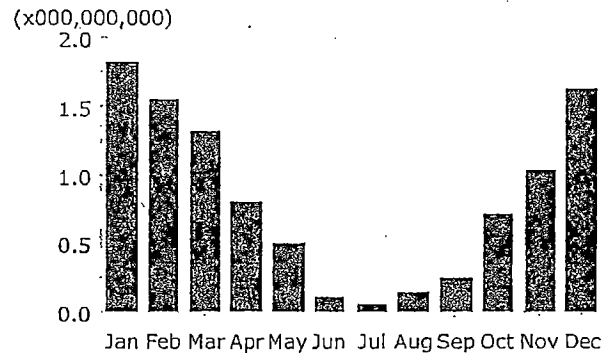


■ Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:02)

# Annual Energy Consumption by Enduse



Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:02)

**Electric Consumption (kWh)****Gas Consumption (Btu)****Electric Consumption (kWh x000)**

|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total         |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| Space Cool    | -            | -            | -            | 0.03         | 1.01         | 3.64         | 6.47         | 4.24         | 1.98         | 0.36         | 0.02         | -            | 17.74         |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -             |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -             |
| Space Heat    | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -             |
| HP Supp.      | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -             |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -             |
| Vent. Fans    | 19.84        | 17.92        | 19.84        | 19.20        | 19.84        | 19.20        | 19.84        | 19.84        | 19.20        | 19.84        | 19.20        | 19.84        | 233.58        |
| Pumps & Aux.  | 0.45         | 0.40         | 0.40         | 0.29         | 0.17         | 0.01         | -            | 0.02         | 0.05         | 0.26         | 0.36         | 0.43         | 2.85          |
| Ext. Usage    | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -             |
| Misc. Equip.  | 4.29         | 3.89         | 4.32         | 4.39         | 4.31         | 4.25         | 4.43         | 4.31         | 4.25         | 4.42         | 3.86         | 4.43         | 51.14         |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -             |
| Area Lights   | 22.87        | 20.72        | 22.99        | 23.78        | 22.93        | 22.83        | 23.85        | 22.93        | 22.83        | 23.82        | 19.95        | 23.85        | 273.34        |
| <b>Total</b>  | <b>47.44</b> | <b>42.93</b> | <b>47.55</b> | <b>47.69</b> | <b>48.26</b> | <b>49.94</b> | <b>54.58</b> | <b>51.34</b> | <b>48.31</b> | <b>48.70</b> | <b>43.38</b> | <b>48.55</b> | <b>578.66</b> |

**Gas Consumption (Btu x000,000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total       |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Space Heat    | 1.82        | 1.55        | 1.33        | 0.81        | 0.50        | 0.11        | 0.04        | 0.14        | 0.26        | 0.71        | 1.04        | 1.62        | 9.92        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Hot Water     | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.02        |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Misc. Equip.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| <b>Total</b>  | <b>1.82</b> | <b>1.55</b> | <b>1.33</b> | <b>0.81</b> | <b>0.50</b> | <b>0.11</b> | <b>0.05</b> | <b>0.14</b> | <b>0.26</b> | <b>0.71</b> | <b>1.04</b> | <b>1.62</b> | <b>9.94</b> |

### Annual Utility Bills (\$)

(x000)

500 -

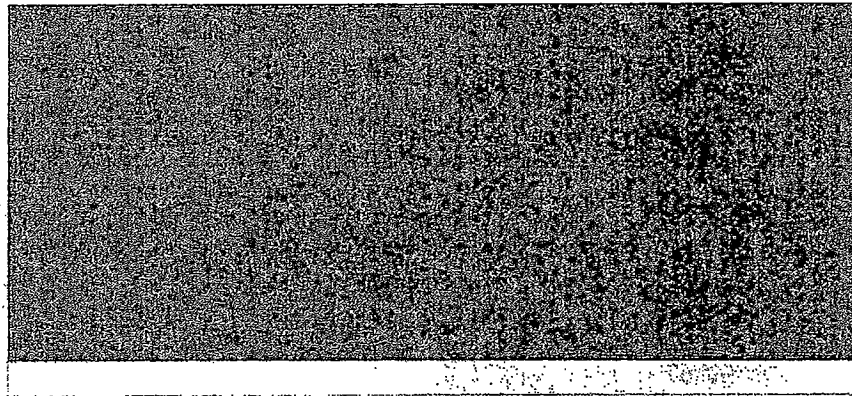
400 -

300 -

200 -

100 -

0



1

Selected Runs (see bottom legend)



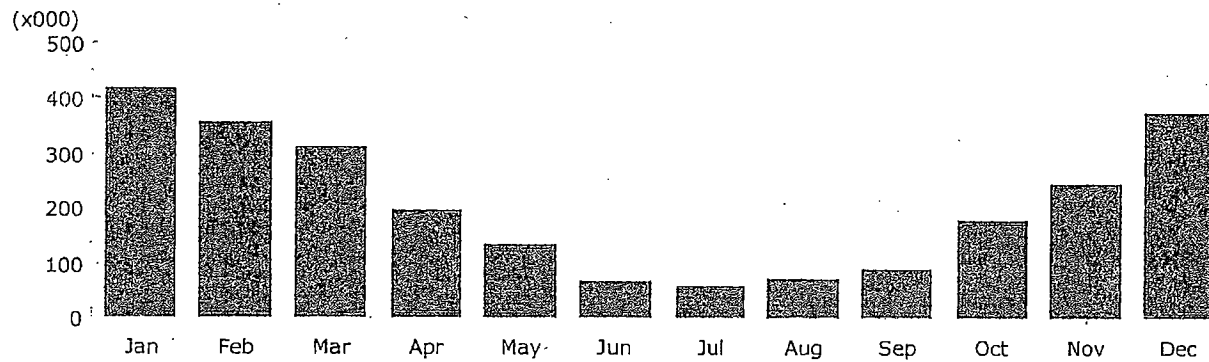
Custom Elec Rate




Custom Gas Rate

1. Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:02) (annual bill: \$ 467,989)

### Electric Consumption (kWh)

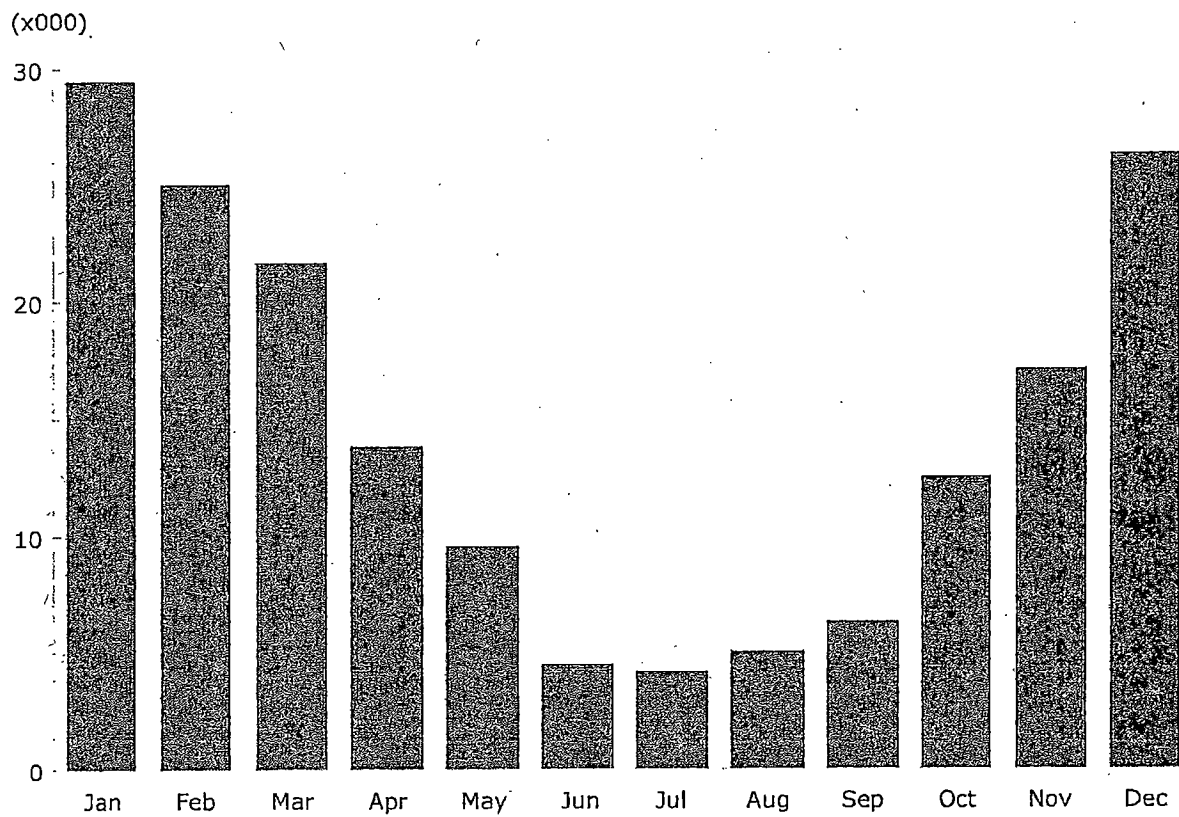


|        | Jan   | Feb   | Mar   | Apr   | May   | Jun  | Jul  | Aug  | Sep  | Oct   | Nov   | Dec   | Total   |
|--------|-------|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|---------|
| Run 1. | 420.5 | 358.8 | 310.5 | 198.3 | 136.0 | 65.0 | 59.4 | 72.3 | 89.3 | 178.4 | 244.5 | 375.8 | 2,508.7 |
| Run 2. |       |       |       |       |       |      |      |      |      |       |       |       |         |
| Run 3. |       |       |       |       |       |      |      |      |      |       |       |       |         |
| Run 4. |       |       |       |       |       |      |      |      |      |       |       |       |         |
| Run 5. |       |       |       |       |       |      |      |      |      |       |       |       |         |

 1. Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:22)

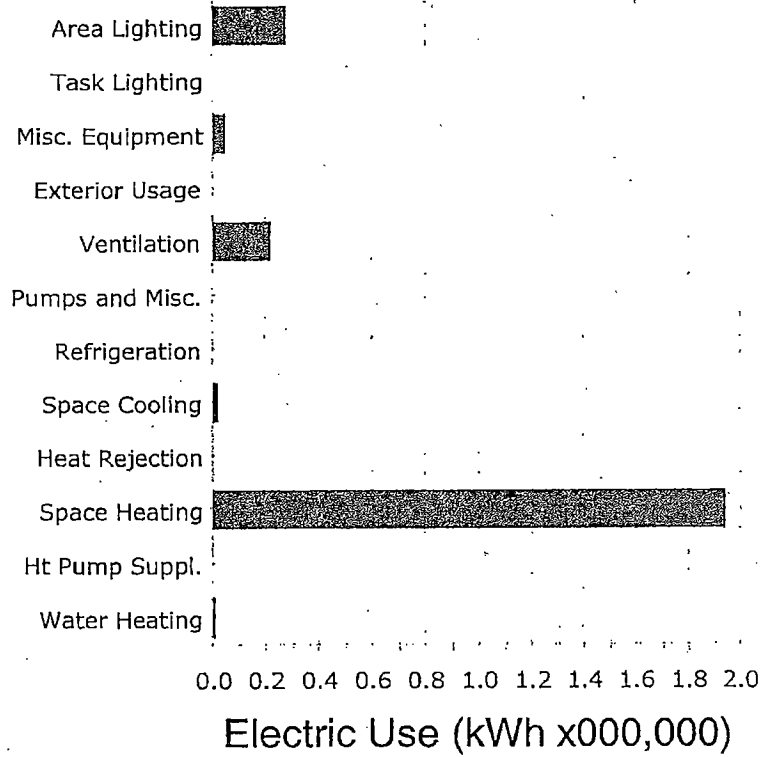
|        | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Run 1. |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Run 2. |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Run 3. |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Run 4. |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Run 5. |     |     |     |     |     |     |     |     |     |     |     |     |       |

### Monthly Utility Bills (\$)



Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:22)

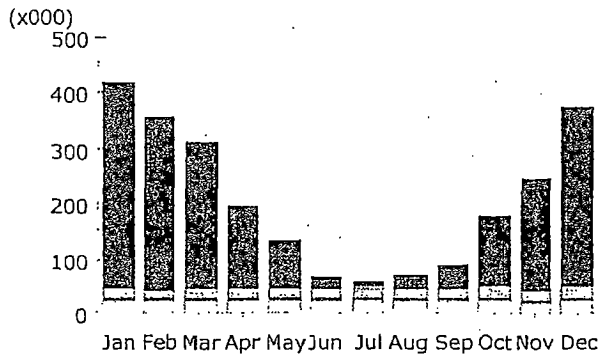
# Annual Energy Consumption by Enduse



Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:22)



### Electric Consumption (kWh)



### Electric Consumption (kWh x000)

|               | Jan   | Feb   | Mar   | Apr   | May   | Jun  | Jul  | Aug  | Sep  | Oct   | Nov   | Dec   | Total   |
|---------------|-------|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|---------|
| Ice Cool      | -     | -     | -     | 0.0   | 1.1   | 3.7  | 6.6  | 4.4  | 2.1  | 0.3   | 0.0   | -     | 18.3    |
| Heat Reject.  | -     | -     | -     | -     | -     | -    | -    | -    | -    | -     | -     | -     | -       |
| Refrigeration | -     | -     | -     | -     | -     | -    | -    | -    | -    | -     | -     | -     | -       |
| Space Heat    | 374.1 | 316.7 | 263.9 | 151.5 | 88.6  | 15.9 | 5.4  | 21.7 | 41.7 | 130.7 | 202.2 | 328.3 | 1,940.8 |
| HP Supp.      | -     | -     | -     | -     | -     | -    | -    | -    | -    | -     | -     | -     | -       |
| Hot Water     | 0.5   | 0.4   | 0.5   | 0.5   | 0.5   | 0.4  | 0.4  | 0.4  | 0.4  | 0.4   | 0.4   | 0.5   | 5.1     |
| Vent. Fans    | 18.6  | 16.8  | 18.6  | 18.0  | 18.6  | 18.0 | 18.6 | 18.6 | 18.0 | 18.6  | 18.0  | 18.6  | 218.5   |
| Pumps & Aux.  | 0.2   | 0.2   | 0.2   | 0.1   | 0.1   | 0.0  | -    | 0.0  | 0.0  | 0.1   | 0.2   | 0.2   | 1.4     |
| Ext. Usage    | -     | -     | -     | -     | -     | -    | -    | -    | -    | -     | -     | -     | -       |
| Misc. Equip.  | 4.3   | 3.9   | 4.3   | 4.4   | 4.3   | 4.3  | 4.4  | 4.3  | 4.3  | 4.4   | 3.9   | 4.4   | 51.1    |
| Task Lights   | -     | -     | -     | -     | -     | -    | -    | -    | -    | -     | -     | -     | -       |
| Area Lights   | 22.9  | 20.7  | 23.0  | 23.8  | 22.9  | 22.8 | 23.8 | 22.9 | 22.8 | 23.8  | 20.0  | 23.8  | 273.3   |
| Total         | 420.5 | 358.8 | 310.5 | 198.3 | 136.0 | 65.0 | 59.4 | 72.3 | 89.3 | 178.4 | 244.5 | 375.8 | 2,508.7 |

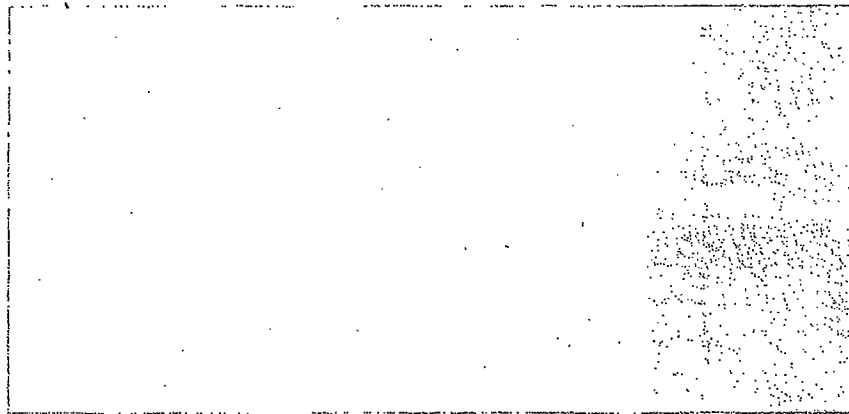
### Gas Consumption (Btu)

|               | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Space Cool    |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Heat Reject.  |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Refrigeration |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Space Heat    |     |     |     |     |     |     |     |     |     |     |     |     |       |
| HP Supp.      |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Hot Water     |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Vent. Fans    |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Pumps & Aux.  |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Ext. Usage    |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Misc. Equip.  |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Task Lights   |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Area Lights   |     |     |     |     |     |     |     |     |     |     |     |     |       |
| Total         |     |     |     |     |     |     |     |     |     |     |     |     |       |

### Annual Utility Bills (\$)

(x000)

180  
160  
140  
120  
100  
80  
60  
40  
20  
0



1

Selected Runs (see bottom legend)

Custom Elec Rate    Custom Gas Rate

1. Karegnondi Waste Water Plant - Baseline Design (04/04/14 @ 11:22) (annual bill: \$ 175,608)

Flint

1st Qtr 2010

TTHM Results

| WSSN  | System         | Mon Prd | Collect Date | Site Code | Analyte | Result | Unit | LRAA  | Units | Results Used |
|-------|----------------|---------|--------------|-----------|---------|--------|------|-------|-------|--------------|
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP1      | 2950    | 0.1624 | MG/L | 0.041 | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP1      | 2950    | 0.1453 | MG/L | 0.077 | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP1      | 2950    | 0.0586 | MG/L | 0.092 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP1      | 2950    | 0.0162 | MG/L | 0.096 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.096        |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP2      | 2950    | 0.1116 | MG/L | 0.028 | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP2      | 2950    | 0.1272 | MG/L | 0.06  | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP2      | 2950    | 0.0333 | MG/L | 0.068 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP2      | 2950    | 0.0168 | MG/L | 0.072 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.072        |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP3      | 2950    | 0.0965 | MG/L | 0.024 | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP3      | 2950    | 0.1183 | MG/L | 0.054 | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP3      | 2950    | 0.0411 | MG/L | 0.064 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP3      | 2950    | 0.0149 | MG/L | 0.068 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.068        |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP4      | 2950    | 0.1064 | MG/L | 0.027 | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP4      | 2950    | 0.1962 | MG/L | 0.076 | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP4      | 2950    | 0.0936 | MG/L | 0.099 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP4      | 2950    | 0.0245 | MG/L | 0.105 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.105        |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP5      | 2950    | 0.0792 | MG/L | 0.02  | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP5      | 2950    | 0.1813 | MG/L | 0.065 | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP5      | 2950    | 0.0339 | MG/L | 0.074 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP5      | 2950    | 0.0181 | MG/L | 0.078 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.078        |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP6      | 2950    | 0.0882 | MG/L | 0.022 | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP6      | 2950    | 0.1444 | MG/L | 0.058 | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP6      | 2950    | 0.0536 | MG/L | 0.072 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP6      | 2950    | 0.0192 | MG/L | 0.076 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.076        |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP7      | 2950    | 0.0822 | MG/L | 0.021 | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP7      | 2950    | 0.1124 | MG/L | 0.049 | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP7      | 2950    | 0.0501 | MG/L | 0.061 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP7      | 2950    | 0.0285 | MG/L | 0.068 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.068        |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP8      | 2950    | 0.0751 | MG/L | 0.019 | MG/L  | 1            |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP8      | 2950    | 0.112  | MG/L | 0.047 | MG/L  | 2            |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP8      | 2950    | 0.0362 | MG/L | 0.056 | MG/L  | 3            |
| 02310 | FLINT, CITY OF | 1Q2015  | 17-Feb-15    | DBP8      | 2950    | 0.0199 | MG/L | 0.061 | MG/L  | 4            |
|       |                |         |              |           |         |        |      |       |       | 0.061        |

DEL?

**Source: <http://www legionella.org/>**

### **1.) What is Legionnaires' disease?**

Legionnaires' disease is a lung infection (pneumonia) caused by a bacterium named *Legionella pneumophila*.

### **2.) What organism causes Legionnaires' disease?**

Legionnaires' disease is caused by bacteria that belong to the family Legionellaceae. This family now includes 48 species and over 70 serogroups. Approximately half of these species have been implicated in human disease. *Legionella pneumophila* is responsible for approximately 90% of infections. Most cases are caused by *L. pneumophila*, serogroup 1. *Legionella* species are small (0.3 to 0.9  $\mu\text{m}$  in width and approximately 2  $\mu\text{m}$  in length) faintly staining Gram-negative rods with polar flagella (except *L. oakridgensis*). They generally appear as small coccobacilli in infected tissue or secretions. They are distinguished from other saccharolytic bacteria by their requirement for L-cysteine and iron salts for primary isolation on solid media and by their unique cellular fatty acids and ubiquinones.

### **3.) Where do Legionella bacteria come from?**

*Legionella* are natural inhabitants of water and can be detected in rivers, lakes, and streams. One type of *Legionella* species (*L. longbeachae*) has been found in potting soil.

### **4.) What is the natural habitat of Legionella bacteria?**

*Legionella* organisms are readily found in natural aquatic bodies and some species have been recovered from soil. The organisms can survive in a wide range of conditions, including temperatures of 0 to 63°C, pH of 5.0 to 8.5, and dissolved oxygen concentrations of 0.2 to 15 ppm in water. Temperature is a critical determinant for *Legionella* proliferation. Colonization of hot water tanks is more likely if tank temperatures are between 40 and 50°C (104 to 122°F). *Legionella* and other microorganisms become attached to surfaces in an aquatic environment forming a biofilm. *Legionella* has been shown to attach to and colonize various materials found in water systems including plastics, rubber, and wood. Organic sediments, scale, and inorganic precipitates provide *Legionella* with a surface for attachment and a protective barrier.

**5.) What have been the water sources for Legionnaires' disease?**

The major source is water distribution systems of large buildings including hotels and hospitals. Cooling towers have long been thought to be a major source for *Legionella*, but new data suggest that this is an overemphasized mode of transmission. Other sources include mist machines, humidifiers, whirlpool spas, and hot springs. Air conditioners are not a source for Legionnaires' disease. They were suspected to be the source in the original American Legion outbreak in a Philadelphia hotel, but new data now suggests that the water in the hotel was the actual culprit.

**6.) How do people contract Legionella?**

The most popular theory is that the organism is aerosolized in water and people inhale the droplets containing *Legionella*. However, new evidence suggests that another way of contracting *Legionella* is more common. "Aspiration" is the most common way that bacteria enter into the lungs to cause pneumonia. Aspiration means choking such that secretions in the mouth get past the choking reflexes and instead of going into the esophagus and stomach, mistakenly, enter the lung. The protective mechanisms to prevent aspiration is defective in patients who smoke or have lung disease. Aspiration now appears to be the most common mode of transmission.

**7.) Is Legionnaires' disease contagious?**

Legionnaires' disease is not contagious. No special precautions are necessary. The disease is transmitted via drinking water, not by infected persons. (So it differs from SARS and influenza where masks must be worn). Likewise, women who are pregnant and their fetuses have nothing to fear from patients with Legionnaires' disease.

**8.) The water piping in my house is plastic instead of the commonly used copper piping. Does that increase the risk of contracting the Legionella bacteria?**

Various plumbing materials have been evaluated for their ability to support the growth of *Legionella* (and other bacteria). Copper pipe is inhibitory, whereas plastic (PVC) pipe will support the attachment and subsequent growth of bacteria- including *Legionella*. If the hot water system temperature is maintained at or above 130°F, growth will be inhibited regardless of pipe materials.

**9.) Our home water supply is infected with Legionnaires'. I am really concerned. I don't drink tap water but my question is do I have to worry about showering, the use of the dishwasher, washing my clothes and especially brushing my teeth.**

We have found that the risk of acquiring Legionnaires' disease from your home water system is quite low. Generally, those who have contracted the disease from their home water systems are usually smokers. Legionella can be isolated from a small percentage of residential water systems. If the bacteria is present, the risk of disease to the average person (with no serious underlying illness) is extremely low. It is also likely to be found in water faucets as well as showers. The role of showers in the transmission of Legionella is overemphasized. Elevated hot water temperature (about 130oF or 55oC) can minimize the chance that Legionella will grow in a water system. Consideration should be given to the risk of scalding to small children and impaired adults if the water temperature is set at this high temperature.

With respect to your question, there is no risk with use of a dishwasher, washing clothes, and showering. For immunosuppressed patients, we recommend that tap water not be drunk. It is theoretically possible to contract Legionnaires' disease from brushing your teeth with tap water.

**10.) My condominium association has received a proposal from a company to check our water for Legionella on a quarterly basis. As far as I know, we have had no cases. My inclination is to say no, but I want to consult an expert.**

The brief answer to your query is "don't culture buildings unless the building houses a high risk group of individuals (chronic lung disease, immunosuppressive illnesses, illnesses requiring chemotherapy/transplant rejection meds/corticosteroids).

The rationale is at least 2.

1. Miniscule attack rate.

Please download the article on the home page of [www.legionella.org](http://www.legionella.org) by Pedro-Botet on Coming of the 3rd Plague. We do recommend that convalescent care facilities housing a notable number of debilitated patients culture their water supply once a year (Seenivisan, J Amer Geriatrics Society 2005 in our Publications section).

2. Maintenance measures directed at water supplies colonized with legionella are not evidence-based; in fact data from our lab shows that virtually all recommendations involving maintenance do not affect legionella colonization.

So, what should the residents of your condominium association do to prevent Legionella infection? 1) Smokers should quit smoking. 2) High risk groups should not drink tap water (Singh, Transplant Infect Dis 2004 on the home page of [www.legionella.org](http://www.legionella.org)). Tap water should be boiled, then cooled and refrigerated for drinking for high-risk patients.

**11.) This is a general question about lab tests for Legionella- I know that the Pittsburgh VA is an authority on Legionella. We recently tested water samples from a camp that hosts retreats for both children and adults, after a Legionellosis case in our region occurred and the patient claimed he had visited the camp a few days before developing symptoms, We sent the samples to our state's public health laboratory and they all came back culture-negative but positive by PCR. The public laboratory sent the results to us saying that this test is still experimental, but they could not explain what that means in terms of control measures. I get the impression that PCR detects Legionella DNA, but only a positive culture can define if the Legionella is viable enough to infect a person. Is this correct? Are repeat tests recommended?**

**The director of this camp is very concerned that any of the lab results came back positive and is thinking about repeating testing. He has looked into this and found a lab that will charge upwards of \$1000 for each investigation. Could you also tell me an estimate of the cost of sending samples to the Pittsburgh VA Lab?**

You are correct that the meaning of a positive PCR/negative culture is unclear. It is for this reason that culture remains the "gold standard" for investigation of cases. We would expect that the cultures would be positive if a water reservoir at the camp was the source of exposure – unless a disinfection procedure had been applied.

An individual that is active enough to go to a camp also would have had the opportunity to be exposed to Legionella in locations besides the camp. The camp director has done all that is necessary and follow-up cultures are not indicated. If they want to culture anyway, our prices can be found under "Laboratory Services."

**12.) I have personally been infected by Legionnaires' disease. What can I do to increase awareness of this infection so that others could be spared this terrible disease?**

The most important problem that we face as physician researchers in this field is that a startling amount of misinformation is present and scientifically validated information that would allow prevention of this infection is not disseminated by public health authorities. It is a fact that *Legionella* is commonly found in the drinking water supply of large buildings.

Since the discovery of the source of the organism in 1982 (Stout, N Engl J Med 1982), this important fact has not been exploited for prevention. Most public health authorities are not interested because of the panic and media exposure that it may bring. Likewise, hospitals are afraid of negative publicity, overlooking the fact that if patients learn that they contracted the

infection from being admitted into a hospital that did not check their water supply for *Legionella* that they would not only sue, but they would win.

The one thing that you can do if you have contracted *Legionella* from a hospital is to ask the following question. Did the hospital have a preexisting policy to culture the water supply? This approach is recommended by state health departments of Maryland and Allegheny Health Department (Pittsburgh). However, Denmark, France, and Barcelona, Spain have also established guidelines for hospitals to culture their water supplies. In 2003, after much foot-dragging, the CDC recommended that all hospitals performing bone marrow and solid organ transplants should culture their water supply. Unfortunately, many cases occur in non-transplant patients. Regardless, we feel that all hospitals should culture their water supplies. CDC has argued in the past that it's expensive, but culture material, including formulation of the Pittsburgh media, is now commercially available, and the cost for materials is probably less than \$500 a year. Nevertheless, they have balked at this recommendation.

Hundreds of outbreaks from hospitals have been reported. Nosocomial (Greek for hospital-acquired) Legionnaires' disease is now commonplace and has become a well known complication.

Approaches for preventing any patients from contracting the disease within a hospital have been published by the State of Maryland and Allegheny County (Pittsburgh) Health Departments. Both health departments recommend that the hospital water supply be cultured for *Legionella*. If *Legionella* is found, the physicians are informed so that if the patient contracts pneumonia while in the hospital, tests for *Legionella* should be immediately available in-hospital. This is a matter of common sense. Moreover, if many of the water sites are positive (for example, greater than 30%), the hospitals can disinfect their water supply. Copper-silver ionization is now the most widely used modality and there are a number of reputable manufacturers for such devices.

Inexplicably, a major obstacle to this approach is the Centers for Disease Control in Atlanta, Georgia, which has been very slow in moving forward on this issue. In 1993, CDC guidelines actually discouraged hospitals from performing routine environmental cultures. They claimed that the evidence was insufficient despite that fact that several hundred reports had documented that *Legionella* could be contracted from hospitals including their own investigations. One of their reasons (which has been convincingly refuted) is that since the organism is ubiquitous, it could exist in hospitals without harming the patients (Yu VL. Resolving the controversy on environmental cultures of legionella. Infect Control Hosp Epidemiol, 1998). We and others now have presented data to show that as many as 70% of hospitals. In some cities harbor *Legionella* (in San Antonio, the number is 100%); this information is critical to disseminate to physicians in the affected hospitals.



In summary, the current approach throughout the world, with some exceptions, is to ignore the problem altogether.

**13.) The building I work in has tested positive for Legionella bacteria. One individual fell sick last week. What are the risks to me if I keep showing up for work and inhaling the air conditioned air? Do you think I should leave? Some hot spots were found in the building...two in air conditioning water cooler towers and one in a ladies bathroom sink one floor beneath me. An outside Legionella risk management company came in to the building to conduct independent testing and found no Legionella bacteria present in the water supply. Then, the City Health Department then conducted their tests; Legionella was present and potent. Is there still a risk if the building has been cleaned? Can you please give some direction. No one is telling us anything.**

It is not well-known to the public that *Legionella* in large building water supplies is commonplace. The fact that *Legionella* was found in the workplace water systems of a sick person does not necessarily mean that this was the source of infection. If the *Legionella* organism was isolated from the patient, molecular typing can be done on both this organism and the *Legionella* recovered from the water systems. If they match, then there is a stronger probability that the workplace was the source.

The reason for not being overly concerned is that unless you have an immunosuppressive underlying illness or smoke cigarettes, you are at little, if any risk. Healthy individuals have many potential sources for exposure to *Legionella* in the community, as well as from home water systems. Although we understand your concern, no guidelines on workplaces or public buildings have been formulated because the risk is so low.

**14.) I have read recently that home hot water pipes may be a breeding ground for Legionella. Is there any kind of filtration system for the home that would solve this or is boiling the only remedy?**

You may want to read the paper on our web site "Legionnaires' disease contracted from patient homes." Unless you are at increased risk of contracting Legionnaires' disease (chronic lung disease, immunosuppression, transplant recipient), you are at such a low risk of becoming infected that there is no need for any action on your part. For individuals at high risk, we recommended increasing the hot water temperature to approximately 60°C (140°F) max. setting on the hot water tank and flushing the outlets for 30 min. with the hot water. This can be done on a quarterly to annual basis to reduce the level of *Legionella* within the system. However, this

procedure is unnecessary for most homes. There is a risk of scalding with water at this temperature, so caution must be exercised if elderly or small children use the water.

Filtration would be expensive because the filter would have to remove particles the size of bacteria (0.2 microns) and they would have to be changed frequently.

### **Disinfection Methods for Legionella in Potable Water Systems**

| <b>Parameters</b>                                            | <b>Copper/Silver Ionization</b>                                                                              | <b>Continuous Chlorination</b>                                                                             | <b>Heat and Flush</b>                       | <b>Chlorine Dioxide</b>                                        |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------|
| Concentration Applied                                        | Cu = 0.2 - 0.8 ppm<br>Ag = 0.02 - 0.08 ppm                                                                   | 2 - 4 ppm<br>as free chlorine                                                                              | 160 F for<br>30 min                         | 0.5 - 1 ppm as<br>ClO <sub>2</sub>                             |
| On-site efficacy documented<br>peer-reviewed literature      | Yes                                                                                                          | Yes                                                                                                        | Yes                                         | Yes                                                            |
| Residual protection<br>throughout the distribution<br>system | Yes                                                                                                          | Yes                                                                                                        | No                                          | Yes                                                            |
| Time to recolonization after<br>system shut-down             | 6 -12 weeks                                                                                                  | 1 -2 weeks                                                                                                 | Varies <sup>1</sup>                         | No information<br>available                                    |
| Temperature                                                  | Residuals unaffected by high<br>temperature                                                                  | Residuals decrease as<br>temperature increases                                                             | NA <sup>2</sup>                             | Residuals<br>decrease as<br>temperature<br>increases           |
| pH                                                           | Elevated pH (>8.5) may<br>affect efficacy                                                                    | Elevated pH (>8.0)<br>affects efficacy                                                                     | No effect                                   | No effect                                                      |
| Disinfection by-product                                      | None known                                                                                                   | Trihalomethane<br>(THMs)                                                                                   | None                                        | Chlorate and<br>Chlorite                                       |
| Taste and odors                                              | None                                                                                                         | Yes                                                                                                        | No                                          | Minimal at high<br>concentrations                              |
| Pipe corrosion                                               | Non observed                                                                                                 | Highly corrosive                                                                                           | Old pipe may be<br>affected                 | Corrosive                                                      |
| Maintenance issues                                           | Scale control<br><br>Routine electrode cleaning<br><br>Routine ion monitoring with<br>AA or ICP <sup>3</sup> | Chlorine storage<br><br>Concentration control and<br>monitoring.<br><br>Corrosion control with<br>silicate | Scalding<br>possible<br><br>Labor intensive | Concentration<br>control and<br>monitoring using<br>DPD method |

1. The delay of recolonization is variable. Elevated hot water temperature can delay recolonization

2. Not applicable.

3. Atomic absorption (AA)/Inductively coupled plasma mass spectroscopy (ICP)

# FLINT TTHM (PPB)

| Location         | 8/24/14 | 5/21/14 | 2/19/14 | 11/20/13 | 8/21/13 | 5/22/13 |
|------------------|---------|---------|---------|----------|---------|---------|
| 3719 DAYTON Rd   | 145.3   | 182.4   | 24.6    | 27.5     | 48.5    | 31.2    |
| 3362 S. DART HWY | 127.2   | 111.6   | 11.1    | 17.2     | 30.8    | 15.5    |
| 2506 Flushing Rd | 196.2   | 106.4   | 12.2    | 19.1     | 29.7    | 17.5    |
| 6204 N. Sag St   | 118.3   | 96.5    | 10.0    | 17.0     | 28.8    | 15.7    |
| 5018 Clia Rd     | 144.4   | 88.2    |         |          |         |         |
| 3216 MLK Blvd    | 112.4   | 82.2    |         |          |         |         |
| 3606 COLUMNA Rd  | 181.3   | 79.2    |         |          |         |         |
| 822 S. DART HWY  | 112.0   | 75.1    |         |          |         |         |

change to  
Flint R.

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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PM Team Reviewer: AECOM and GCDC WWS

LHWI Contract: S.4004 - KWA Water Supply System



Date: 2/19/2014

Submittal: 100% Submittal Drawings

| Comment Number | Sheet Number | Comment                                                                                                                                                                 | Response                                                                                                                                                                                                                                                                                                               |
|----------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ✓ 1            | Cover        | Semco is listed as a natural gas utility. Are they located around this project?                                                                                         | It's the only gas utility in the area. It is listed in case it is needed                                                                                                                                                                                                                                               |
| ✓ 2            | C-2.1        | Silt Fence for staging area and Enbridge crossing? Looks like it is missing.                                                                                            | Silt fence is called out. Snow fence shown on Enbridge crossing but not called out. Call out added.                                                                                                                                                                                                                    |
| ✓ 3            | C-3.1        | Add note pointing to water line for pressure sustain valve - "See C-5.1"                                                                                                | Done.                                                                                                                                                                                                                                                                                                                  |
| ✓ 4            | C-3.1        | Connect Meter vault to PS building for corrosion protection. Other notes in corrosion protection emailed.                                                               | Done. (Received after 100% submittal)                                                                                                                                                                                                                                                                                  |
| ✓ 5            | C-3.2        | Call out Bollards at typical (TYP) - this was a carry over from 90% comments.                                                                                           | All bollards are labeled individually, since a circle is used for other items. TYP is only used when there is no possibility of confusion.                                                                                                                                                                             |
| 6              | C-4.1        | Drainage of asphalt East of pump station still looks like it will drain towards the pump station. Can something be placed to intercept flow coming from entrance drive? | The entrance road is crowned; storm runoff directed to edge of road into CB-6 and CB-7. Pavement around IPS is 6" below finished floor elev. There is a swale running north, 10 feet off the building that is 2.5" lower than the asphalt on the south end and 7.2 inches lower on the north end which drains to CB-1. |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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| Comment Number | Sheet Number | Comment                                                                                                                                                                    | Response                                                                                |
|----------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| ✓ 7            | C-4.2        | will there be cleanouts on the pressure sustaining valve sump pump force main?                                                                                             | Cleanouts added.                                                                        |
| ✓ 8            | C-4.2        | Is a manhole required for the connection of the pressure sustaining valve vault sump pump to the storage tank drain line?                                                  | See Item 7.                                                                             |
| 9              | C-5.1        | Do we want Sc. 80 PVC for the water line to the pressure sustaining valve?                                                                                                 | Yes. Sch. 80 is for buried pipe only. Pipe changes to copper 5 feet outside of chamber. |
| 10             | C-5.1        | What is the manhole access on the header bypass for?                                                                                                                       | Required by Owner.                                                                      |
| 11             | C-5.1        | left side of page - do we want to call out 45 degree bend and thrust block?                                                                                                | Yes.                                                                                    |
| 12             | C-5.1        | Call out pipe material for 36" bypass line. Make consistent. It is called out as both DI and Steel on different sheets.                                                    | Corrected.                                                                              |
| 13             | C-5.1        | There is no stationing on the 66" pipe shown on the left side of the sheet plan view. Also, need to show continuation of pipeline for S-4003 (in lighter shaded)           | Stationing is shown. Continuation of S-4003 added.                                      |
| 14             | C-5.2        | need to call out size of air/vacuum valves.                                                                                                                                | Air/Vacuum valve sizes shown on C-6.14; added to Table.                                 |
| 15             | C-5.2        | Suction pipe profile - should this say 'Pump Station Suction Pipe Profile'? Inlet pipe profile - should this say 'Tank Inlet Pipe Profile' same for overflow pipe profile. | Done.                                                                                   |
| 16             | C-6.1        | what is modular pipe seal?                                                                                                                                                 | Generic term for Link Seal (link seal is proprietary)                                   |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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| Comment Number | Sheet Number     | Comment                                                                                                                                                  | Response                                                                                                                               |
|----------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 17             | C-6.1            | "6'x7' floor door" - Verify type, make this is a Bilco                                                                                                   | Bilco contacted. They indicated that they do make a door of this size, quote obtained. Both Bilco and Halliday are named in the specs. |
| 18             | C-6.1            | Remove 24" x 48" aluminum checker plated hatch on top plan                                                                                               | Hatch needed to remove valve.                                                                                                          |
| 19             | C-6.2            | meter vault will be extended to tie into pump station wall.                                                                                              | Done (received after 100% submittal)                                                                                                   |
| 20             | C-6.2            | Verify spec section 05500 is applicable for the aluminum checkered plate                                                                                 | Yes it is.                                                                                                                             |
| 21             | C-6.3            | Do not like the idea of pumping septic. Can this be done by gravity?                                                                                     | Was gravity initially. County required elevation necessitated the need of sump pump.                                                   |
| 22             | C-6.4            | Detail B shows concrete around well, is this how it will be constructed? If so, how thick is the concrete pad?                                           | Pad will be 4-inch and will be called out.                                                                                             |
| 23             | C-6.4            | this is not consistent with how detail sheet should be set up.                                                                                           | Specifically what does this mean. Clarification needed.                                                                                |
| 24             | Standard Details | Standard detail sheets from the PM team should not have details deleted or crossed out. If an entire sheet is not necessary, that sheet can be left out. | None of the sheets have crossed out details. Was 100% submittal used?                                                                  |
| 25             | C-6.6/6.11       | A detail is on both sheets. These sheets were modified from the version provided by the PM team...                                                       | Deleted details from C-6.6                                                                                                             |
| 26             | A-1.13           | Text formatting issues. Window types detail is all black                                                                                                 | CHMP                                                                                                                                   |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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| Comment Number | Sheet Number | Comment                                                                                                                                            | Response                                                                |
|----------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 27             | S-1.1        | Section and detail callouts need to be cleaned up, especially on Plan at el. 810.00                                                                | Done.                                                                   |
| 28             | S-1.6        | Lintel schedule - note #2 is not clear. Where is a detail of this?                                                                                 | Lintel details are shown on architectural drawing wall sections.        |
| 29             | P-1.2        | Text callouts for reducers and Tees are covered by line work                                                                                       | Fixed.                                                                  |
| 30             | P-1.2        | Need a section cut to show surge relief piping                                                                                                     | Done.                                                                   |
| 31             | P-1.3        | does this valve need a pedestal? Can we put on wall?                                                                                               | Yes, it needs pedestal. No cannot be put on wall.                       |
| 32             | P-1.3        | 90% comment review indicated that additional stantion support details would be added. Where are they?                                              | See sheet P-1.7 and P-1.8.                                              |
| 33             | P-1.4        | air/vacuum valve should be on detail sheet. does piping and tap need to be 2" for the 2" air/vacuum valves? What about the 6" air/vacuum valves?   | Requirement of 6" air/vacuum valve received after 100% submittal. Done. |
| 34             | P-1.8        | Here is the air/vacuum valve again                                                                                                                 | Yes, this is the Detail Sheet for Piping Details.                       |
| 35             | M-1.2        | VTR and ED should be spelled out somewhere. Should the non/mechanical parts be shaded out so it's easier to see what is going on in this drawings? | VTR and ED are defined in the "Key" on sheet M-1.5.                     |
| 36             | M-1.4        | EWC?                                                                                                                                               | EWC is now defined in the "KEY" on sheets M-1.4 and M-1.5               |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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| Comment Number | Sheet Number | Comment                                                                                                                                                                                                     | Response                                                                                                                                                       |
|----------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 37             | E-1.10       | Text is not readable on backpressure chamber section plan. Why is section plan label floating in space and covered by line work?                                                                            | Corrected.                                                                                                                                                     |
| 38             | C-5.1        | Verify storage tank drain. <i>AS</i><br><i>Sump now</i>                                                                                                                                                     | <i>Add Drain Line</i><br>There is no storage tank drain.                                                                                                       |
| 39             | C-5.1        | Is there any water quality concerns with the two 48" stubs shown.? If so, provide blow offs.                                                                                                                | Blow off provided.                                                                                                                                             |
| 40             | C-5.1        | Should gate valve GV 1-1 be a check valve to bypass station during power outages?                                                                                                                           | Per instruction of Owner all bypass will be handled manually.                                                                                                  |
| 41             | C-5.1        | <del>Should the meter chamber be located further west on the discharge line in order to provide a reading when station is in bypass mode? This may also move the increaser from 48 to 60 further west</del> | Is this a suggestion or a instruction? It can be done, but will need more time. Also, corrosion details will have to be modified and provided by PM. <i>NO</i> |
| 42             | C-5.1        | <del>Need water supply to spray down 7MS GST floor to remove mud?</del>                                                                                                                                     | <i>Pumper Truck</i><br>Will be added if instructed to do so. <i>NO</i>                                                                                         |
| 43             | C-6.1        | Provide visual indication stem on PSV                                                                                                                                                                       | Pressure gauge shown on I-1.3, We will increase 1/2" tap upstream of PSV to 2" and add a 2" tap d downstream of the PSV for pressure gauges                    |
| 44             | C-6.1        | Provide one inch tap in PSV chamber and set visual read pressure gauge                                                                                                                                      | We have included two 2-inch taps, upstream and downstream of the PSV for pressure gauges (calibration).                                                        |
| 45             | C-6.1        | <del>Provide two inch tap in PSV chamber for calibrating valve and possible future insertion magmeter.</del>                                                                                                | Why do we need magmeter on a PSV? Magmeter is for flow. See Item 43 and 44. <i>Taps Only</i>                                                                   |
| 46             | I-1.9        | Provide tray to set lap top on panel door and plug in                                                                                                                                                       | Pending ✓                                                                                                                                                      |



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| Comment Number | Sheet Number | Comment                                                                                                                                                                                      | Response                                                                                                                                                        |
|----------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47             | C-4.1        | Should have different line weights between contracts.                                                                                                                                        | Corrected.                                                                                                                                                      |
| 48             | C-4.1        | Show landscaping along Hull Road.                                                                                                                                                            | Per conversation with M. Raysing on 3/11/14 landscaping will be added. Pending.                                                                                 |
| 49             | C-5.1        | show limits of owner provided pipe                                                                                                                                                           | Done.                                                                                                                                                           |
| 50             | C-6.1        | show fence as 'lean in' only type.                                                                                                                                                           | Probably refers to C-5.1. What is a "lean-in" fence. (Silt fence? Snow fence?) <b>See item 2.</b>                                                               |
| 51             | S-1.2        | do we want a ring on pipe for straight pieces?                                                                                                                                               | (S-1.12), Collar plates are not required on the pipes shown by sections HH and Z on sheet S-1.12 since the other thrust blocks can take all the lateral thrust. |
| 52             | P-1.8        | Stanchion pipe support should be designed for workability for future repair. Consider making the W12x40 post in two sections (top and bottom). Consider how a field repair will be feasible. | A bolted connection will be added at the top portion of the stanchion for ease of removal                                                                       |
| 53             |              |                                                                                                                                                                                              |                                                                                                                                                                 |

Lean  
out  
Barb  
Wire

North Arrow Adjust on some sheets

Detention Basin Fence?

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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PM Team Reviewer: AECOM and GCDC WWS

LHWI Contract: S.4004 - KWA Water Supply System

Date: 2/19/2014

Submittal: 100% Submittal PDR and Specifications



| Comment Number | Page Number                              | Comment                                                              | Response                                                                          |
|----------------|------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 1              | Specification TOC                        | Verify Consistency with HRC Specifications                           |                                                                                   |
| 2              | Specification Agreements                 | Add requirement for Lynn Twp. on land use approval                   | What does this mean? Pending.                                                     |
| 3              | Specification TOC Additional information | Remove this section                                                  | This was taken out at the 30% Submittal and we were instructed to put it back in. |
| 4              | Specifications Appendix                  | Lay schedule needs to be included with contract documents            | Recently received, will be included. Pending. ✓                                   |
| 5              | 00200-9 Instruction to Bidders           | 14.02 - This should reference <u>KWA</u> not GCDC                    | This refers to an address. Do you really want to change this?                     |
| 6              | 00400-1 Bid Form                         | This should reference <u>KWA</u> not GCDC                            | This refers to an address. Do you really want to change this?                     |
| 7              | 00400-7 Bid Form                         | remove item d - Siemens from top of page. Verify ASCO is acceptable. | Siemens removed. ✓                                                                |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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| Comment Number | Page Number | Comment                                                                                                                                                               | Response                                                                                                                                 |
|----------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 8              | 00500-1     | insert the MGD of the raw water pump station and storage tank in the Article 1 Bold description. <i>MG</i>                                                            | Done. ✓                                                                                                                                  |
| 9              | 00500-1     | 4.02 - <i>487</i> calendar days. <i>→ Rather give less</i> Where does this out us? <i>Substn Completion Oct. 1 Max</i>                                                | Pending <i>Total 12/31</i>                                                                                                               |
| 10             | 00800-2     | Owner's Representative - Should be (GCDC)                                                                                                                             | Done. ✓                                                                                                                                  |
| 11             | 00800-8     | 5.03-B - KWA should be #1. then re-number from there.                                                                                                                 | Done. ✓                                                                                                                                  |
| 12             | 0800-16     | This section needs to be a little work. Needs to be very clear with the project has, which permits the contractor needs, which approvals the contractor needs, etc... | Pending                                                                                                                                  |
| 13             | 00800-17    | number 4. on top of sheet - "copies of the permits, <b>approvals, or pending permits</b> , can be found..." Add language.                                             | Done.                                                                                                                                    |
| 14             | 01500-13    | item 21 - Permit fee \$0??                                                                                                                                            | Refers to Contractor SESC permit. No permit or bond required.                                                                            |
| 15             | 02081-2     | 2.1-b-3 - Verify counter-clockwise is correct. Verify all hydrants are owner supplied                                                                                 | Owner will be supplying hydrant. He will determine rotation. Spec 02081 (Hydrants) will be revised to indicate owner supplied equipment. |
| 16             | 11214-1     | Note that pumps are owner supplied                                                                                                                                    | Done                                                                                                                                     |
| 17             | 13200-2     | 1.3 a - list acceptable manufacturers                                                                                                                                 | Done. We have included DN Tanks and PRELOAD.                                                                                             |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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| Comment Number | Page Number  | Comment                                                                                                                                                                                                                                                | Response                                                                                                                                                                                                |
|----------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18             | 13207-3      | 1.8-a - List acceptable manufacturers                                                                                                                                                                                                                  | Done. Only AQUASTORE recommended.                                                                                                                                                                       |
| 19             | 13316-13     | Not sure if we want to show this here or as an attachment.                                                                                                                                                                                             | Will be included as an attachment. (Pending)                                                                                                                                                            |
| 20             | 16225-6      | 2.1 A - not familiar with Baldor electric company                                                                                                                                                                                                      | Should Baldor be removed? Pending.                                                                                                                                                                      |
| 21             | 16345-4      | 2.1 D - no Siemens                                                                                                                                                                                                                                     | Siemens removed.                                                                                                                                                                                        |
| 22             | TOC - page 3 | Appendix F, G, & H are missing.                                                                                                                                                                                                                        | To be addressed.                                                                                                                                                                                        |
| 23             | page 5       | Permit tracking - what is the status of the St. Clair county road permit? What is the status of the Lynn Twp. review?<br><br>Has GCDC or PM team seen comments from LCCA?<br><br>NPDES permit will not be done by Spicer. J&H is responsible for this. | We have resubmitted drawing to St. Clair Road Com. for review.<br>Lynn Twp. review????<br>All comments from CCA sent to Owner and PM. We are addressing the issues.<br>NPDES permit has been addressed. |
| 24             | Page 8       | Should Sheet C-5.1 be included as a figure or in the appendix?<br>Would be easier than pulling out plan set to check.                                                                                                                                  | Done.                                                                                                                                                                                                   |
| 25             | Page 9       | Valve sequencing should be reviewed.<br>3.1.2.1 - should GV 1-1 be closed and GV 1-3 be open?<br>3.1.2.2 - should GV 1-3 be closed?                                                                                                                    | Valve sequencing reviewed and corrected.                                                                                                                                                                |
| 26             | Page 12      | No appendix J or K. Is appendix B the correct one for the storm sewer design table?                                                                                                                                                                    | To be addressed.                                                                                                                                                                                        |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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| Comment Number | Page Number | Comment                                                                                                  | Response                               |
|----------------|-------------|----------------------------------------------------------------------------------------------------------|----------------------------------------|
| 27             | Page 14     | Is appendix B the correct one for system curves?                                                         | To be addressed.                       |
| 28             | Page 40     | end bevels?                                                                                              | Corrected. Reference to bevels remove. |
| 29             | Appendix B  | why are there so many different things in this appendix?                                                 | To be addressed.                       |
| 30             | Appendix D  | Appendix A TOC - MDEQ permit act 399 - delete 'part 451-91' Add inter-county drain agreements as another | To be addressed.                       |
| 31             |             |                                                                                                          |                                        |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

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PM Team Reviewer: AECOM and GCDC WWS

LHWI Contract: S.4004 - KWA Water Supply System

Date: 2/19/2014

Submittal: 100% Submittal Electrical and I&C Review



| Comment Number | Page Number | Comment                                                                                                  | Response                                                                                                                                                     |
|----------------|-------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1              | E-1.1       | Light Fixture Schedule – Types EX1 and EX2 are identical – consolidate or provide differentiation.       | EX2 is Pendant mounted                                                                                                                                       |
| 2              | E-1.3       | MPZ BP feeder is undersize for voltage drop based upon placement on E-1.4. Resize for less than 5% drop. | Will change size to #8 AWG                                                                                                                                   |
| 3              | E-1.3       | LP-1 feeder/breaker is much less than main breaker shown for LP-1 on schedule. Resize both.              | Main Lugs are indicated. Feeder breaker serves as the main                                                                                                   |
| 4              | E-1.3       | THW-2 feeder 75 deg rating is less than breaker trip – coordinate.                                       | TWH-2 feeder conductors are rated at >125% of load. Conductor ampacity (85 amp) does not correspond to standard breaker trip rating. Allowed by code to use. |
| 5              | E-1.6       | L-9 (North Edge Pump Room) does not show on HVAC schedule - coordinate                                   | Should be L-8 - will change                                                                                                                                  |
| 6              | E-1.6       | Chemical Room – Note 1 should be Note 6                                                                  | Should be note 11 will change                                                                                                                                |
| 7              | E-1.6       | Pump Room – BFV-3-1/-2/-3/-4 Note 4,6 should be Note 4                                                   | Should be notes 4,8 will change                                                                                                                              |

| Comment Number | Page Number       | Comment                                                                                                                                                                                  | Response                                                                                                                                                                        |
|----------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8              | E-1.6             | Pump Room – KV-2-1/-2/-3/-4 Note 4,6 should be Note 4                                                                                                                                    | Should be notes 4,8 will change                                                                                                                                                 |
| 9              | E-1.7             | Left side Sump Pumps – symbol shown is 3 Ph motor – these are single phase motors - coordinate                                                                                           | Will correct symbol                                                                                                                                                             |
| 10             | E-1.7             | Right side – Chemical Room – TWH-1 has no reference for power source -                                                                                                                   | Has been changed                                                                                                                                                                |
| 11             | E-1.7             | Right side – Chemical Room – EF-8 represented as 3 phase motor – it is single phase – correct                                                                                            | Will correct symbol                                                                                                                                                             |
| 12             | E-1.7             | All LP/RP/MPZ panel references – add circuit number to provide consistent presentation with S-4001.                                                                                      | Will add                                                                                                                                                                        |
| 13             | E-1.8             | All RP panel references – provide circuit                                                                                                                                                | Will add                                                                                                                                                                        |
| 14             | PDR 3.6.7.1/E-1.8 | PDR states all paths of egress to be illuminated. Lighting Fixture schedule – There does not appear to be any egress fixture listed – only outdoor. NFPA 101 7.8 requires egress lights. | Emergency exit lights at each building exit door and stairway from basement. Emergency lights type EM to illuminate paths of egress until standby generator power is available. |
| 15             | E-1.9             | South end of electric room – TC reference add -1 to LP ckt no 4 reference.                                                                                                               | Circuit no. 4 is correct                                                                                                                                                        |
| 16             | E-1.10            | Backpressure Chamber – remove extraneous lines in area of 1" C 4-1 PR Shielded text.                                                                                                     | Removed                                                                                                                                                                         |
| 17             | E-1.11            | For all panels/all used circuits – add panel/circuit identification to drawing locations where the devices are shown including plans, details, schematics, etc.                          | OK.                                                                                                                                                                             |

| Comment Number | Page Number                      | Comment                                                                                                                                                                                                                             | Response                                                                                                                                                                                                                                        |
|----------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18             | E-1.11                           | E-1.12 appears to list UV control panel powered from RP-2 but it does not appear in schedule – coordinate.                                                                                                                          | Will move to RP-2 schedule                                                                                                                                                                                                                      |
| 19             | E-1.12/.13/.14/.15<br>/17        | Add panel/ckt source to items on dwgs requiring power.                                                                                                                                                                              | O.K.                                                                                                                                                                                                                                            |
| 20             | 16010                            | Cable test sheets after end of 16010 do not seem to indicate they belong to or are referenced to specific part of 16010 other than being at the end of the section. No HV cable specifications are found – shouldn't there be some? | We will incorporate the cable test sheets into the specification section. We will review the test sheets and make necessary corrections. Medium Voltage cable specifications and testing are in specification 16123 2.1 and 2.11B respectively. |
| 21             | 16075 3.4 E<br>4./G1             | Finish editing                                                                                                                                                                                                                      | Editing appears to be completed                                                                                                                                                                                                                 |
| 22             | 16135<br>2.1.1./2.2.G/2.4.<br>M. | May want to consider LED as other lighting is.                                                                                                                                                                                      | Will revise spec                                                                                                                                                                                                                                |
| 23             | 16312 2.6 B.1.                   | Might want to consider digital and file instead of photograph and negatives.                                                                                                                                                        | Agree. We will make the change                                                                                                                                                                                                                  |
| 24             | 16510                            | The specification does not address LED type fixtures which are shown in the fixture schedule. Text on HID and Fluorescent is not applicable and should be removed.                                                                  | Will revise spec                                                                                                                                                                                                                                |
| 25             | 16520 1.6 B.                     | Finish editing                                                                                                                                                                                                                      | Will remove this section as there is no parking lot or roadway lighting.                                                                                                                                                                        |
| 26             | 16530                            | Egress lighting not addressed.                                                                                                                                                                                                      | Egress lighting (emergency and exit) is addressed. Will revise spec to reflect LED fixtures.                                                                                                                                                    |
| 27             | 16902 1.1 B.7.                   | Verify Section Reference                                                                                                                                                                                                            | Removed                                                                                                                                                                                                                                         |



| Comment Number | Page Number | Comment                                                                                                                  | Response                                           |
|----------------|-------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 28             | I-1.2       | Cannot find Valve Control Panel with any label for it. Found references on E-1.10 and E-1-17 drawings.                   | Corrected                                          |
| 29             | I-1.3       | Cannot find Surge Relief Valve callout on this or drawing I-1.2.                                                         | Corrected                                          |
| 30             | I-1.3       | Cannot find reference to Pump Inlet Valves KV-2-1 through 4.                                                             | Corrected                                          |
| 31             | I-1.3       | Cannot find reference to Pump E-Stop switches 1 – 4.                                                                     | Corrected                                          |
| 32             | I-1.3       | Cannot find Hydraulic Unit for Pump 1 – 4 Discharge Valves.                                                              | Corrected                                          |
| 33             | I-1.3       | Note 1 reference at Sump High Level switch refers to E-1.12, but it is really on E-1.13 use Note 2..                     | Corrected                                          |
| 34             | I-1.4       | Cannot find I/I signal isolator for Inlet pressure signal. Cannot find power feed for this device on electrical drawing. | Corrected. I/I moved to main PLC panel. See I-1.10 |
| 35             | I-1.4       | Discharge Temperature is labeled TIT-2 (Room Temp) and I-1-.14 labels it TIT-1.                                          | Corrected                                          |
| 36             | I-1.4 – 1.7 | Septic System DI signal is not shown on any of these drawings but called out in Section 13390 I/O list.                  | Corrected. See I-1.7                               |
| 37             | I-1.8       | Detail needed for cable float in Chemical Tank. See comment in Section 13424 about compatibility of materials.           | Corrected                                          |

Program Management Team  
KWA Water Supply System – 100% Submittal Comments

Page: 15 of 15

| Comment Number | Page Number   | Comment                                                                                                                                                                      | Response                                                                                                                                                           |
|----------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 38             | I-1-10        | Line 1078 shows contacts from CR1078, but they should be from CR1004.                                                                                                        | Corrected                                                                                                                                                          |
| 39             | Section 13390 | Drawing I-1.17 Hydraulic Unit Accumulator Rack calls DI Low Pre Charge Pressure, called low PreCheck pressure here. Coordinate.                                              | Corrected                                                                                                                                                          |
| 40             | Section 13390 | FS-1 Water Flow Switch shows Analog Input should be Digital input according to drawing I-1.6                                                                                 | Corrected                                                                                                                                                          |
| 41             | Section 13410 | Paragraph 2.2 C is blank. Consider removing.                                                                                                                                 | Corrected                                                                                                                                                          |
| 42             | Section 13424 | What type of cable is to be used to suspend float in Calcium Hypochlorite solution in tank. Check material compatibility only expensive metals stand up. Paragraph 2.2 C, D. | Polypropylene (PP) and Polyvinylidene Fluoride (PVDF) are highly resistant to calcium chloride. Material compatibility requirement has been added in Section 13424 |
| 43             |               |                                                                                                                                                                              |                                                                                                                                                                    |
| 44             |               |                                                                                                                                                                              |                                                                                                                                                                    |

## DEPARTMENT OF ENVIRONMENTAL QUALITY

### GOVERNOR'S OFFICE BRIEFING PAPER CITY OF FLINT DRINKING WATER

#### What contributed to the Boil Water Advisories in the city of Flint?

A number of factors, not one specific cause, likely contributed to the Boil Water Advisories (BWAs) in the city of Flint during August and September 2014. While use of the Flint River has increased the amount of natural organic matter in the city's water, the Flint Water Treatment Plant (WTP) has performed well above treatment requirements for organic carbon removal. In addition, less than 20 percent of the water system was included in the advisory area. If treatment had been compromised, detections would have been widespread throughout the city, rather than in such a localized area.

The city's water distribution system has suffered from a lack of infrastructure investment and asset management. Most of the city's over 550 miles of water mains are now over 75 years old and constructed of cast iron piping. Cast iron pipe is subject to internal corrosion, called tuberculation, which causes buildup on the pipe interior, leading to water quality issues, reduced flow and pressures, and leakage. Tuberculation also encourages the development of biofilms, layers of bacteria that attach to the interior pipe wall. Biofilm growth is common in areas of piping with little or no disinfectant residual, and together with tuberculation can clog water lines to the point of insufficient water pressure.

The city has also experienced decades of a declining user base and water use associated with vacant homes, commercial businesses, and industrial property. Declining water use leads to excess residence time within the city's distribution pipes and water storage facilities, accelerating tuberculation, biofilm growth, and disinfectant residual degradation. While the city has recently seen an infusion of funding for blight removal, contractors completing this work have been improperly using fire hydrants, causing hydraulic disturbances that dislodged and suspended settled debris, which may have contributed to the bacterial contamination.

The winter of 2014 was also one of the coldest experienced by the water system. The city, which historically has unaccounted water losses of over 30 percent, has seen even greater losses since February 2014 due to an increase in cold weather-related water main breaks and leaks. The city lacks a formal maintenance program for its over 7,250 valves, which would normally be used to limit impacts during break repairs. Two valves on the transmission line used to supply the area of the BWAs were found to be closed during the city's investigation, causing longer residence time, reduced disinfectant residual, reduced flow, and reduced pressure. One of these valves has remained broken.

The BWAs also occurred during the warmest and, for 2014, relatively wet periods of August and September. Warm weather conditions are not only more conducive to bacterial growth but also degrade the water's disinfectant residual carried out from the WTP more quickly. Longer residence times, biofilms, and tuberculation also contribute to disinfectant residual degradation. Warm wet weather conditions also allow water contaminated with bacteria to pool around piping with leaks and breaks.

### **Process for Issuance and Cancellation of a Boil Water Advisory**

There are a number of conditions that can trigger BWAs. This includes the following:

- Bacteria Monitoring Detections
- Bacteria Standards Violations
- Treatment System Failures
- Waterborne Disease Outbreaks
- Loss of System Pressure
- Water Main Breaks
- Other Interruptions in Service

The Department of Environmental Quality (DEQ) has developed a policy and procedure regarding BWAs to help guide staff, provide consistency, and maintain public health. A PDF of Policy and Procedure No. ODWMA-399-022 is being forwarded with this briefing paper.

BWAs may be self-initiated by the water system, issued collaboratively in consultation with the DEQ, or when necessary mandated by the DEQ. Requesting customers to boil the water when bacterial contamination has occurred provides an added barrier of public health protection.

The BWAs that recently occurred in the city of Flint were associated with bacteria monitoring detections and violations of bacteria standards. These advisories were issued by the city of Flint collaboratively in consultation with the DEQ.

Current regulations regarding monitoring and standards for bacteria in water distribution systems were developed by the U.S. Environmental Protection Agency, have been in effect since 1990, and were incorporated into the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. There are a variety of bacteria, parasites, and viruses that can potentially cause health problems if humans ingest them in drinking water. Testing water for each of these potential pathogens would be difficult and expensive. Instead, water systems test for total coliform and *E.coli*. Total coliform bacteria react to water treatment in a manner similar to many pathogens. Therefore, the presence of total coliform in drinking water indicates there may be a pathway for pathogens or other contaminants to enter the system. The absence of total coliforms in the distribution system minimizes the likelihood that pathogens are present. *E.coli* is itself a pathogen, and its detection would be direct evidence of a health risk.

Once a BWA has been issued, time is needed to investigate potential causes and implement corrective measures. The larger the water system, the more time this may take. Once corrective measures have been taken, samples must be collected and analyzed to confirm that bacteria are no longer present. Using the most common analytical method, samples must be incubated for a period of 24 hours before results can be obtained. In situations where the bacterial contamination has been confirmed, two consecutive rounds of safe samples collected at least 24 hours apart are normally obtained before canceling a BWA. Adding each of these steps together, a normal response period to cancel a BWA under these circumstances would be expected to take at least 3 to 4 days.

### **Recent History of the City of Flint Water System**

Historically, the city of Flint had been a customer of the Detroit Water and Sewerage Department (DWSD) while simultaneously maintaining the Flint WTP to provide emergency backup service using the Flint River. The WTP performed quarterly test operations to maintain readiness and was utilized twice in 2009, supplying water once for 2 days and the other for 3 days.

In April 2013 the city of Flint notified the DWSD that it would be terminating service in the future and contracting for raw water service from the Karegnondi Water Authority (KWA). Work on the KWA pipeline from Lake Huron broke ground in June 2013 and is expected to be completed with connection in late 2016.

In August 2013 Rowe Professional Services Company completed an engineering proposal for improvements to the Flint WTP that would allow continuous operation of the WTP utilizing the Flint River in lieu of continuing service from the DWSD until completion of the KWA pipeline. In March 2014 the city of Flint entered into a Consent Agreement with the DEQ regarding the Flint WTP's lime sludge facility. In April 2014 the DEQ issued a construction permit for improvements to the Flint WTP. On April 25, 2014, the city of Flint began continuous operation of the WTP, using water from the Flint River and discontinued the purchase of water from the DWSD.

A BWA was issued for August 15-20, 2014, for a portion of the city of Flint due to localized detections of total coliform and *E.coli* bacteria. Another BWA was issued for September 5-9, 2014, due to localized detections of total coliform bacteria in the same and adjacent portions of the city of Flint. The advisory covered an area of approximately six square miles. The city of Flint has a total land area of just over 34 square miles.

While many of the BWA contributing factors listed above require long-term solutions, the city has taken operational steps to limit the potential for a BWA to reoccur. The city has increased flushing of water mains to limit residence time, maintain disinfectant residual, and help remove buildup and deposits within the piping. The city is boosting chlorine disinfectant residual at locations in the distribution system as needed. The city continues to investigate water leaks and water main breaks and the status and condition of system valves.

Prepared by: Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
Department of Environmental Quality  
October 1, 2014

# CITY OF DETROIT

## News Release

Water and Sewerage Department

Dave Bing, Mayor

**FOR IMMEDIATE RELEASE**

**Date: Wednesday, April 17, 2013**

**Media Contact:**

**Mary Alfonso, DWSD (313) 964-9477**

### **DWSD DIRECTOR MAKES STATEMENT ON FLINT'S DECISION**

*Statement by Director Sue F. McCormick, prepared by Bill Johnson for DWSD*

On April 15, 2013, the Detroit Water and Sewerage (DWSD) presented a good faith, comprehensive proposal to the City of Flint, the Genesee County Drain Commission and the Karegnondi Water Authority (KWA).

The essential elements of the proposal were that it offered Flint/Genesee an opportunity to reserve capacity in the Lake Huron Treatment Plant and accept assignment of capital and operations costs from a specific facility under the terms of a Public/Partnership. The calculated savings included an immediate 50-percent reduction in water unit costs, and approximately \$800 million in total savings over the term of the proposed 30-year contract.

It was disappointing that one day after our submission, Genesee County Drain Commissioner Jeff Wright and Ed Kurtz, Flint's emergency manager, summarily rejected our offer. We had pinned our hope on having the opportunity to have a meaningful discussion about the merits of our plan and the long-term benefits to Flint and its customers. Unfortunately, we were not afforded that opportunity this week or at any time during recent months.

We have subsequently advised Flint that the existing agreement we have with the city to provide water services is hereby terminated effectively one year from today's date (April 17, 2014).

We remain fully committed to holding harmless the remaining customers served by the DWSD system, up to and including all available legal options to recoup the "stranded costs" in the existing 25-mile pipeline, the Imlay Booster Station, and other facilities that primarily serve Flint and Genesee County.

We also remain open to engage Genesee County officials on any alternatives that would be mutually beneficial to DWSD and Flint going forward.

***Please direct all media inquiries to Bill Johnson at (248) 840-1095.***

# # #



# flint's WATER SYSTEM

Service  
area

34

SQUARE  
MILES

Public water mains  
550+ MILES

Public water  
mains that are  
75+ years old  
250+ MILES

Total service  
connections:  
32,900



Service connections  
that are lead:  
~15,000

Lead and copper sampling  
(6-month period)

COMPLETED: January 2015  
QUANTITY: 100 samples  
RESULTS: 90th percentile = 6 ppb

COMPLETED: July 2015  
QUANTITY: 69 samples  
RESULTS: 90th percentile = 11 ppb

## on the horizon

JANUARY 2016: Flint plans to have optimized corrosion control treatment operational

JULY 2016: Flint plans to connect to Karegnondi Water Authority (which will bring in drinking water from Lake Huron)



# IS YOUR CHILD SAFE FROM LEAD POISONING?

## LEARN HOW TO PROTECT YOUR FAMILY: CREATE A LEAD SAFE HOME

### What causes lead poisoning?

There are many places in a home that can put babies and children in danger of lead poisoning.

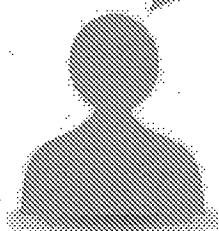
Lead paint is the #1 cause of lead poisoning in Michigan and is often found in homes built before 1978. The older the home, the more likely that painted surfaces like windows, cupboards, doors and porches will contain lead paint.

Lead poisoning occurs most often when children come in contact with lead in the air, in dust particles and in lead paint. Lead dust is created when windows are opened and closed, or when surfaces age and paint chips or peels. When dust and chips fall on the floor they get on hands and toys. When a child puts hands or toys in their mouth, they can become lead poisoned.

### How can I tell if my child has lead poisoning?

Talk to your doctor about testing your child's blood for lead poisoning.

When should my child be tested for lead poisoning?



Children should be tested at one and two years of age or if you think your child has been exposed to a lead hazard.

To learn more about lead poisoning prevention and blood lead testing, call the Childhood Lead Poisoning Prevention Project:

**(517) 335-8885**

**(888) 322-4453**

### Take this quiz to see if your child may have lead poisoning:

Symptoms of lead poisoning can be silent—and hard to recognize. Preventing lead poisoning before it happens is the best way to keep your family safe. Take this quiz to see if your child may be at risk:

Does your child currently live in a home built before 1950 or have they lived in a home built before 1950 in the recent past? Do they spend time at or often visit a home built before 1950?

Yes No Don't know

Does your child currently live in a home built before 1978 that was recently remodeled? Have they lived in or often visited a home built before 1978 that was recently remodeled?

Yes No Don't know

Does your child have a brother, sister or playmate with lead poisoning?

Yes No Don't know

Does your child live with an adult whose job or hobby involves lead?

Yes No Don't know

Does you or your child's caregiver use home remedies that may contain lead?

Yes No Don't know

If you answered NO to all of these questions, your child is probably not at risk for lead poisoning. If you answered YES or DON'T KNOW to any of these questions, talk to your doctor about testing your child for lead poisoning.

# SAFE CLEANING IN YOUR HOME

Use these steps to help keep your home clean and reduce your child's risk of exposure:



**Put on gloves.** If you do not have rubber gloves, wash your hands well after cleaning.

**Use the right cleaners and disposable supplies.** Use soapy cleaners or products made to remove lead dust.



**Remove paint chips first.** Window areas and porches often have peeling paint and lead dust. Pick up visible chips and dispose of them in a plastic bag.

**Always wet-mop floors and window sills.** Do not broom lead dust. Dispose of cloths after wiping each area. If using a mop, replace water frequently.



**When using a vacuum, make sure it is a HEPA vacuum.** Some health departments have HEPA vacuums available to borrow.

**Rinse after cleaning.** Use clean water and a new mop head or fresh paper towels to wipe away suds.

**Always empty wash water down a toilet.**



**Repeat these steps often** when dirt and dust appear on floors, porches, window wells, window sills, stairs and children's play areas.

**Note:** Areas that should be cleaned include windows, doors, floors, porches, stairs and child play areas.

**Important:** Do not use your vacuum. It will spread lead dust into the air you breathe.

## What can I do to protect my child from lead?

- Wash hands, bottles, pacifiers and toys often.
- Always take off shoes before going into the house.
- Flush your pipes before drinking, and only use cold water for cooking and mixing formula. Flush pipes by running the water for approximately 5 minutes.
- Watch your child's diet. Foods high in calcium and iron help keep lead from being absorbed by a child's body.
- Avoid using power sanders, open-flame torches, heat guns, dry scrapers and dry sandpaper on painted surfaces.
- Fix peeling or chipping paint.
- Use a certified Repair and Remodeling Professional when making updates to your home.
- Practice safe cleaning methods.



Thinking about remodeling your home? Need advice about identifying and removing lead paint? Call the Lead and Healthy Homes Section: 866-691-LEAD.

[www.michigan.gov/lead](http://www.michigan.gov/lead)



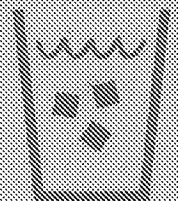
# TAKING ACTION ON FLINT WATER

City of Flint Water

## - Tips for Flint Residents -

Lead plumbing is common in homes built prior to 1986, and anyone in the state with lead pipes in their home can take some extra precautions to minimize lead in their drinking water.

1. Get your water tested at no cost to ensure water is safe. To get your water tested, please call the city of Flint Water Plant at (810) 787-6537 and then press 1.

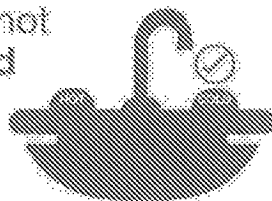


2. To ensure safe drinking water, you can also get a free filter. Please visit [mi.gov/FlintWater](http://mi.gov/FlintWater) to find where you can get a free filter.

3. It takes time for lead to accumulate in drinking water from plumbing, and so flushing your pipes prior to using them can minimize your exposure.

To flush your pipes, let the water run for as long as it takes, but take as little as 30 seconds if you have recently flushed the pipes. If you have not used water in your home for as long as 2 to 3 months, pipes have not used and water in pipes can be full of lead. Running the water for 5 minutes costs between 3 and 10 cents.

4. Additionally, more lead gets into hot water than cold water. Use only cold water for drinking, cooking and making baby formula.



To get your water tested for free, please call the city of Flint Water Plant at (810) 787-6537 and then press 1. You can also email [flintwater@cityofflint.com](mailto:flintwater@cityofflint.com).

Visit [www.mi.gov/FlintWater](http://www.mi.gov/FlintWater) for more information

# **TAKING ACTION** ON FLINT WATER

## - The Action Plan -

- Testing in Flint public schools immediately to ensure that **drinking water is safe**, with testing also available at no cost to any other school in Flint.
- Offering **free water testing** to Flint residents to assure their drinking water is safe.
- Providing **free water filters** to residents with concerns or who are included in state assistance programs.
- Expanding **health exposure testing** of individual homes.
- Accelerating **corrosion controls** in the Flint drinking water system.
- Accelerating **water system improvements** to address replacing lead service lines.
- Expediting the completion of the **Karegnondi Water Authority** pipeline.
- Expanding a **Safe Drinking Water Technical Advisory Committee** to ensure the best technology, practices and science are being followed by adding an expert from the Environmental Protection Agency's Office of Research and Development to the group.
- Naming Dr. Eden Wells, chief medical executive for the Michigan Department of Health and Human Services, as the **Flint drinking water public health adviser**.
- Boosting a **comprehensive lead education program** to make sure residents have detailed information about how to protect themselves and their homes.

To get your water tested for free, please call the city of Flint Water Plant at (810) 787-8537 and then press 1.  
You can also email [flintwater@cityofflint.com](mailto:flintwater@cityofflint.com)

Visit [www.mi.gov/FlintWater](http://www.mi.gov/FlintWater) for more information



# DRINKING WATER - LEAD - DISTRIBUTION OF RESPONSIBILITIES

| Environmental Protection Agency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Michigan Department of Environmental Quality                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Promulgation of Federal Safe Drinking Water Act Rules</li> <li>2. 1974 Safe Drinking Water Act                         <ul style="list-style-type: none"> <li>- 1991 Lead and Copper Rule</li> <li>- 2000 Lead and Copper Rule Minor Revisions</li> <li>- 2007 Lead and Copper Rule Short Term Revisions</li> <li>- 2017 Lead and Copper Rule Long Term Revisions</li> </ul> </li> <li>3. Granting Primacy of Federal Regulations to States</li> <li>4. Auditing of State Public Water Supply Programs</li> <li>5. Provide Funding to States</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ol style="list-style-type: none"> <li>1. Primacy - Michigan Safe Drinking Water Act and Administrative Rules</li> <li>2. Oversight of public water systems</li> <li>3. Inspections</li> <li>4. Construction Permitting</li> <li>5. Provide loans to water systems for public infrastructure improvements</li> <li>6. State Laboratory Services</li> <li>7. Laboratory Certification</li> <li>8. Establish monitoring requirements, quantity and frequency</li> <li>9. Verification of monitoring results and compliance determination</li> <li>10. Notify water systems of Action Level Exceedance</li> <li>11. Establish Water Quality Parameter Ranges, as necessary</li> <li>12. State Reporting to EPA</li> <li>13. Operator Training and Certification</li> </ol> |
| City of Flint Water Customers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Water Customers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <ol style="list-style-type: none"> <li>1. Certified Operation of public water system</li> <li>2. Establish Water Rates</li> <li>3. Obtain construction permits</li> <li>4. Reporting to MDEQ</li> <li>5. Coordination of lead and copper sampling                         <ul style="list-style-type: none"> <li>- Establishing a Tiered Sampling Pool</li> <li>- Providing Sampling Kits and Instructions to customers</li> <li>- Obtain signed statements from participating customers</li> <li>- Obtain sample analysis</li> <li>- Provide individual lead sample result to participants</li> <li>- Comply with Action Levels for lead and copper</li> <li>- Provide lead monitoring and notice Certification to MDEQ</li> </ul> </li> <li>6. Provide Annual Report (CCR) to all customers</li> <li>7. Conduct Water Quality Parameter Monitoring</li> <li>8. Recommend and Install Optimized Corrosion Control Treatment</li> <li>9. Provide Public Notification, as necessary</li> <li>10. Replace public portion of lead service, as necessary</li> </ol> | <ol style="list-style-type: none"> <li>1. Participate in lead sampling as requested</li> <li>2. Request lead testing if concerned</li> <li>3. Follow lead sampling Instructions</li> <li>4. Provide signed information on how sample was collected</li> <li>5. Review individual result material</li> <li>6. Follow instructions for reducing lead exposure</li> <li>7. Replace private leaded service line and plumbing materials with lead-free products</li> <li>8. Obtain plumbing permits and comply with code requirements</li> <li>9. Pay Water Bills</li> <li>10. Read Annual Report (CCR)</li> <li>11. Read and follow Public Notification materials</li> </ol>                                                                                                |

**From:** "Henry, James" <jhenry@gchd.us>

**Date:** March 10, 2015 at 6:40:17 PM EDT

**To:** Howard Croft <hcroft@cityofflint.com>, "Mike Prysby (DEQ)" <prysbym@michigan.gov>, Elizabeth Murphy <emurphy@cityofflint.com>, "Natasha Henderson" <nhenderson@cityofflint.com>, Jerry Ambrose <gambrose49@gmail.com>, Dayne Walling <dwalling@cityofflint.com>

**Cc:** "Valacak, Mark" <MVALACAK@gchd.us>, "Cupal, Suzanne" <scupal@gchd.us>, "Hasan, Shurooq" <shasan@gchd.us>, "Childs, Bonnie" <BCHILDS@gchd.us>, "Hallwood, Dawn" <dhallwood@gchd.us>, "Johnson, M.D., Gary" <GJOHNSON@gchd.us>

**Subject:** Information Request and Documentation

Hello everyone,

The Genesee County Health Department has made several written and verbal requests for specific information since October, 2014, including a Freedom of Information Act Request on January 27, 2015. The information still has not been received and the city's lack of cooperation continues to prevent my office from performing our responsibilities.

The Genesee County Health Department has the responsibility to conduct illness investigations and consider all potential sources, this is not optional. In 2014, Genesee County experienced a significant increase of confirmed Legionella illnesses relative to previous years. Legionella can be a deadly, waterborne disease that typically affects the respiratory system.

The increase of the illnesses closely corresponds with the timeframe of the switch to Flint River water. The majority of the cases reside or have an association with the city. Also, McLaren Hospital identified and mitigated Legionella in their water system. This is rather glaring information and it needs to be looked into now, prior to the warmer summer months when Legionella is at its peak and we are potentially faced with a crisis.

This situation has been explicitly explained to MDEQ and many of the city's officials. I want to make sure, in writing that there are no misunderstandings regarding this significant and urgent public health issue. The Trihalomethane issues "pale in comparison" to the potential public health risks of Legionella.

I am submitting the attached FOIA request again and requesting that the legal obligations of the request are met. If the information is not available, please let me know. In the past, I have requested to meet with the water plant staff and MDEQ regarding Legionella concerns. I did not receive a response from the water plant staff and MDEQ declined. I think it is in the best interest for all stakeholders that we meet and discuss the issues.

Respectfully,

Jim

Jim Henry

Jim Henry RS, MBA

Environmental Health Supervisor

Genesee County Health Department [www.gchd.us](http://www.gchd.us)

630 S. Saginaw St., Suite 4

Flint, MI 48502-1540

Phone (810) 257-3618 Fax (810) 257-3125

E-mail [jhenry@gchd.us](mailto:jhenry@gchd.us)

been completed by now. Both DEQ and DCH had the same reaction to their statement about the river before they complete their investigation.

Steve, Liane and I will be meeting tomorrow morning to discuss further. We may be meeting with the executive office as well.

---

**From:** Benzie, Richard (DEQ)  
**Sent:** Wednesday, March 11, 2015 7:33 PM  
**To:** Shekter Smith, Liane (DEQ)  
**Cc:** Busch, Stephen (DEQ); Prysby, Mike (DEQ)  
**Subject:** RE: Information Request and Documentation

Liane,

Steve's initial response is below.

As I see it, we need a plan of action fast.

- 1) Inform DEQ management, including legislative and media liaisons; suggest additional communication with DCH
- 2) Prepare response to Genesee County email – did anyone in ODWMA or DEQ have any contact with Genesee County about Legionella and if so, when and what? Was anyone in ODWMA or DEQ requested to meet with Genesee County to discuss Legionella and if so, when, and did they “decline” to meet?
- 3) Contact Flint to alert them of County's concerns and determine their response to the January 27<sup>th</sup> FOIA request.
- 4) Arrange for a meeting with Genesee County and other parties as deemed appropriate by DEQ management – DCH, Flint, Governor's Office, etc.; Establish a “Lead” agency but also develop a team approach to move forward and determine an appropriate, common message as well as when such information should be shared and by whom. Determine how long has Genesee County, DCH, and Flint been aware of the increased cases of Legionella and what the message should be about delays in public notification.
- 5) Determine additional steps – possible monitoring protocols, premise plumbing treatment options, public precautions if any, etc.; Consider possible CDC assistance.
- 6) Determine if EPA will be willing to share their draft Legionella guidance document being developed by a workgroup consisting of EPA, the States of Ohio, Minnesota, Pennsylvania, Washington, Nevada, Missouri and Nebraska, and CDC. The guidance will characterize the effectiveness of treatment technologies to address Legionella and address relevant regulatory implications. The primary implication is that individual customers that install “secondary” treatment systems to remove, reduce or prevent Legionella in their premise plumbing (such as hospitals are already doing) become by federal definition, public water systems required to comply with all applicable requirements of the Safe Drinking Water Act. The guidance has been delayed by internal reviews at EPA, but they are hoping to be able to have a final document in summer of 2015.

That's all I can think of at this point. Let me know what you think.

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Wednesday, March 11, 2015 9:37 AM  
**To:** Prysby, Mike (DEQ); Benzie, Richard (DEQ)  
**Subject:** RE: Information Request and Documentation

Mike,

I am not aware of a meeting request from Jim Henry or the Genesee County Health Department as indicated in his email below. Did you receive any such request?

The FOIA is specifically directed to the City of Flint not the DEQ. If requested some of the information asked for regarding Total Coliform and E.Coli compliance sampling could be provided, but there may also be additional construction repair sampling data.

We can respond to Jim when you get back in, but at this point while the change in source may have created water quality conditions that could provide additional organic nutrient source to support legionella growth, there is no evidence or

confirmation of legionella coming directly from the Water Treatment Plant or in the community water supply distribution system at this time.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

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**From:** Prysby, Mike (DEQ)  
**Sent:** Wednesday, March 11, 2015 7:35 AM  
**To:** Busch, Stephen (DEQ); Benzie, Richard (DEQ)  
**Subject:** Fwd: Information Request and Documentation

I am out today and will return tomorrow. Having trouble getting the attachment to open on my phone...but since it appears to be a FOIA regarding Legionella, I felt it is prudent to get this message to you. I will be available tomorrow to discuss or compile any info that we have.

Sent from my iPhone

Begin forwarded message:

**From:** "Henry, James" <jhenry@gchd.us>  
**Date:** March 10, 2015 at 6:40:17 PM EDT  
**To:** Howard Croft <hcroft@cityofflint.com>, "Mike Prysby (DEQ)" <prysbym@michigan.gov>, Elizabeth Murphy <emurphy@cityofflint.com>, "Natasha Henderson" <nhenderson@cityofflint.com>, Jerry Ambrose <gambrose49@gmail.com>, Dayne Walling <dwalling@cityofflint.com>  
**Cc:** "Valacak, Mark" <MVALACAK@gchd.us>, "Cupal, Suzanne" <scupal@gchd.us>, "Hasan, Shurooq" <shasan@gchd.us>, "Childs, Bonnie" <BCHILDS@gchd.us>, "Hallwood, Dawn" <dhallwood@gchd.us>, "Johnson, M.D., Gary" <GJOHNSON@gchd.us>  
**Subject:** Information Request and Documentation

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Respectfully,

Jim

**Jim Henry**

Jim Henry RS, MBA

Environmental Health Supervisor

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
OFFICE OF DRINKING WATER AND MUNICIPAL ASSISTANCE  
**2014 WATER SUPPLY CROSS CONNECTION REPORT**

Issued under authority of 1976 PA 399, as amended, and the administrative rules.  
Failure to submit this form is a violation of the Act and may subject the water supply to enforcement penalties.

Administrative Rule R 325.11405 states in part that "a water utility shall report annually to the department on the status of the cross connection control program on a form provided by the department." Return the completed form by March 31, 2015 to the appropriate Department of Environmental Quality (DEQ) district office. For district office addresses, visit [www.michigan.gov/deq](http://www.michigan.gov/deq) and click on Locations.

WSSN: 2310

- A. Name of water utility: City Of Flint County: Genesee
- B. Year that the current written cross connection control program was approved by DEQ: 1974
- C. Total number of industrial, commercial, institutional, residential, and governmental accounts that must be routinely reinspected for cross connections: Active Accounts 2012  
Of this number,  
- How many are High Hazard accounts: 313 Frequency of Reinspection: Once per Year  
- How many are Low Hazard accounts: 1699 Frequency of Reinspection: Once per 3/Years
- D. Number of accounts from line "C" that received an initial inspection in 2014: 12
- E. Total number of reinspections required and completed in 2014 based on degree of hazard:  
- High hazard reinspections required: 313 High hazard reinspections completed: 197  
- Low hazard reinspections required: 566 Low hazard reinspections completed: 374
- F. Number of accounts where a cross connection(s) was found to exist during inspections or reinspections in 2014: 41
- G. Number of accounts from line "F" where corrective actions have been completed: 41
- H. Total number of accounts from line "C" which are now in compliance with the local cross connection control program;  $H = C - (F - G)$ : 2012
- I. Total number of backflow prevention devices in system requiring testing: 1018
- J. Number of backflow prevention devices tested in 2014: 766

Narrative Description of Program

(Outline briefly any changes or significant findings since last reporting; use additional sheets if necessary.)

Budget, and personel constraints as well as added duties for the inspector, continue to be a challenge to the CCC Program in The City. We continue in our effortto move forward.

Name: Glenn Thomas

Title: Cross Connection Control Coordinator

Date: 3/23/2015

X-comm

WSD or recent kept or record

X-comm Issues

- out of date devices
- repaired business w/out prior
- missing vacuum breakers

KWA-2016

-1 1/2 yrs

DWSD

- BWA

Flint River ~~can~~ can be treated

Matt Foundation

↳

Water + Sewer Fund

Asset Management

- ① Tell people we met (Prom DER?)
- ② OE → Mfg
- ③ Followup Meeting
- ④ work w/ other agencies



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING



DAN WYANT  
DIRECTOR

March 20, 2014

VIA E-MAIL

Mr. Peter Bade, Chief legal Officer  
City of Flint  
1101 South Saginaw Street  
Flint, Michigan 48502-1757

Dear Mr. Bade:

SUBJECT: Consent Order (Order); City of Flint; 5200 Bray Road, Flint, Michigan;  
Waste Data System Number 468691

Enclosed please find a fully executed original of the Consent Order between the City of Flint and the Department of Environmental Quality (DEQ). The Consent Order became effective on March 20, 2014, the date it was signed by the Chief of the Office of Waste Management and Radiological Protection. Please note that the civil penalty required by Paragraph 9.1 of the Consent Order is due by April 30, 2014.

Thank you for your cooperation in resolving this matter.

Sincerely,

John Craig, Chief  
Enforcement Section  
Office of Waste Management and  
Radiological Protection  
517-284-6546

DEQ  
RESOURCE MANAGEMENT DIVISION

MAR 26 2014

LANSING DISTRICT

Enclosure

cc/enc: Mr. Michael Robinson, Warner Norcross & Judd, LLP  
Mr. Robert Reichel, Department of Attorney General  
Mr. Steven Busch, DEQ  
Mr. Lawrence Bean/Mr. Jim Arduin, DEQ  
Mr. Richard Brim, DEQ

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
OFFICE OF WASTE MANAGEMENT AND RADIOLOGICAL PROTECTION

In the matter of the  
administrative proceedings against  
City of Flint, doing business at  
5200 Bray Road, Genesee Township,  
Genesee County, Michigan

---

OWMRP Order No. 115-01-14

CONSENT ORDER

This proceeding results from unresolved allegations specified in the Letters of Warning, (LOWs) issued on April 9, 2001, and February 14, 2002, and Compliance Communications, dated April 15, 1997, April 19, 2002, September 8, 2003, October 28, 2003 and January 18, 2011, by the Department of Environmental Quality ("DEQ") (Attachment 1). The DEQ, Office of Waste Management and Radiological Protection ("OWMRP") alleges that the city of Flint ("Respondent") at 5200 Bray Road, Genesee Township, Genesee County, Michigan (the "Site"), placed or allowed the placement of solid waste in an Open Dump at the Site, or otherwise violated Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, Michigan Compiled Laws ("MCL") 324.101 *et seq.* ("NREPA"), and the administrative rules promulgated under Part 115. The Respondent and the DEQ agree to resolve the alleged violations set forth in the above-referenced LOWs and Compliance Communications by entry of this Consent Order.

STATEMENT OF PURPOSE

In entering into this Consent Order, the mutual objectives of the Respondent and the DEQ are to address the Open Dump created at the Site, eliminate any surface water discharge from the Site to the Cornwell Drain, and allow the Respondent to reconstruct the system used to manage drinking water treatment plant ("WTP") residuals so that Respondent may resume dewatering lime sludge at the site.

To accomplish these objectives, the Respondent agrees to determine the horizontal and vertical extent and character of any solid waste historically disposed of at the Site including, but not

limited to, the WTP residuals and any solid wastes identified as being disposed of in the above-referenced LOWs and Compliance Communications. Consistent with the waste characterization and other investigation data, the Respondent agrees to either remove and dispose of some or all of the solid waste to be taken to a disposal area that is licensed by the DEQ or, alternatively, in lieu of complete removal of all solid waste, all solid waste that is left in place will receive final cover over it in accordance with the requirements of Part 115 and this Consent Order. In addition, the Respondent agrees to determine, by conducting a remedial investigation, whether any response activities must be taken to address contamination caused by the unauthorized disposal of solid waste at the Site. The Respondent also agrees to manage the historically accumulated lime sludge at the Site as solid waste and dispose of it in accordance with Part 115 requirements, unless it is determined by proper characterization that the historically accumulated lime sludge is not solid waste or that it can be authorized for use on farmland applied at appropriate agronomic rates or for some other beneficial reuse, or that it can be left in place. The Respondent agrees to include a plan for the removal of the historically accumulated lime sludge at the Site as a condition of this Consent Order.

Finally, if the Respondent proposes to reconstruct the system for the dewatering of WTP residuals at the Site, then the Respondent agrees to submit plans and specifications and secure from the DEQ, Office of Drinking Water and Municipal Assistance ("ODWMA"), a public water supply construction permit issued under Section 4 of the Safe Drinking Water Act, 1976 PA 399, as amended ("Act 399"), MCL 325.1001 *et seq.*, and the administrative rules under Act 399 prior to initiating any construction, alteration, addition, or improvement to such system. If it is determined that the historically disposed WTP lime sludge and other residuals are not solid wastes, then an acceptable residuals management plan for the historically disposed of lime sludge and other WTP residuals, as well as lime sludge and any other WTP residuals generated in the future, must also be included as part of the construction permit application. The Respondent plans to participate in the Karegnondi Water Authority ("KWA") to receive source water from Lake Huron for its drinking water supply and the use of its WTP to meet treatment requirements under Act 399. It will be approximately four years before the KWA infrastructure is built and water is available to the Respondent from KWA. The Respondent plans to use the Flint River as its source water supply for its WTP until KWA water is fully available. However, the Respondent may continue to use water from the Flint River (i) as a supplement to KWA water and (ii) as a back up to KWA water if the need arises. Public improvement projects under Act 399 are required to be completed for the Respondent to

receive water from the KWA. The Respondent must undertake the KWA public improvement project or undertake other public improvement projects to continue to use the Flint River, such as additional WTP public improvements, source water protection public improvements, and public improvements to obtain a back-up water supply, in order to comply with Act 399.

#### I. DEFINITIONS

- 1.1 "Act 399" means the Safe Drinking Water Act, 1976 PA 399, as amended, MCL 325.1001 *et seq.*
- 1.2 "FAM" means the financial assurance mechanism acceptable to the DEQ to assure payment for monitoring, operation and maintenance, oversight, and other costs determined by the DEQ to be necessary to ensure the effectiveness and integrity of the remedial action. The FAM is a component of the Remedial Action Plan.
- 1.3 "NREPA" means the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, MCL 324.101 *et seq.*
- 1.4 "Open Dump" means any area, place, or property where solid waste has been illegally disposed of or abandoned in place of other disposal. For the purposes of this Consent Order, the Open Dump includes any solid waste historically disposed of at the Site.
- 1.5 "Part 115" means Part 115, Solid Waste Management, of the NREPA, MCL 324.11501 *et seq.*, and the Part 115 Administrative Rules.
- 1.6 "Part 115 Rules" means the administrative rules promulgated under Part 115.
- 1.7 "Part 201" means Part 201, Environmental Remediation, of the NREPA, MCL 324.20101 *et seq.*, and the Part 201 Administrative Rules.
- 1.8 "Residuals Management Plan" means a DEQ-approved plan to address both historical and future accumulations of lime sludge and other WTP residuals from the Site.



- 1.9 "Site" means the property located at 5200 Bray Road, Genesee Township, Genesee County, Michigan. The Site occupies approximately 76 acres of land adjacent to the Cornwell Drain on its northern boundary. The Cornwell Drain is a tributary to the Flint River.
- 1.10 "Solid Waste" as used in this Consent Order means "solid waste" as defined in Part 115 of the NREPA, MCL 324.11506(1), including any solid waste that has been disposed of at the Site and the lime sludge from WTP operations conducted by the Respondent.

## II. STIPULATIONS

The Respondent and the DEQ stipulate as follows:

- 2.1 Pursuant to its authority under Part 115, the DEQ promulgated administrative rules necessary to implement Part 115. These rules are set forth in the 2005 *Annual Administrative Code Supplement* (AACS), R 299.4101 *et seq.* ("Part 115 Rules").
- 2.2 Pursuant to its authority under Act 399, the DEQ promulgated administrative rules necessary to implement Act 399. These rules are set forth in the 2009 AACS, R 325.10101 *et seq.* ("Act 399 Rules").
- 2.3 Pursuant to the NREPA and Executive Order No. 2011-1, the Director of the DEQ ("Director") is the state official and the DEQ is the state agency charged with the administration and enforcement of Part 115 and Act 399. This Consent Order is authorized under MCL 324.11519(2) and MCL 325.1022.
- 2.4 The Respondent is a "person" as defined by MCL 324.301(g) and MCL 325.1002(m).
- 2.5 The Respondent owns and operates the Site. The Respondent is a municipality in the state of Michigan.
- 2.6 The Site consists of a WTP residuals area and contains various water level control structures and discharge points to the Cornwell Drain, and an area where solid waste has been disposed of in the Open Dump. Attachment 2 is an aerial schematic of the

- Site and shows the approximate boundaries of the WTP residuals area and the Open Dump.
- 2.7 The Respondent stipulates that the issuance and entry of this Consent Order is proper and acceptable. This Consent Order shall be considered a final order of the DEQ and shall become effective on the date it is signed by the Chief of the OWMRP ("Office Chief"), designee of the Director, pursuant to MCL 324.301(b) of the NREPA.
- 2.8 The Respondent agrees to fully and strictly comply with all provisions of Part 115 and Act 399, the Part 115 Rules, the Act 399 Rules, and all other applicable state and federal statutes.
- 2.9 The Respondent and the DEQ agree that the signing of this Consent Order is for settlement purposes only and does not constitute an admission by the Respondent of the allegations contained in the above-referenced LOWs and Compliance Communications or that the law has been violated.

## II. COMPLIANCE PROGRAM

In order to resolve the violations alleged in the above-referenced LOWs and Compliance Communications, and this Consent Order, the Respondent shall achieve and maintain compliance with the requirements specified below in accordance with the following schedule:

- 3.1 On and after the effective date of this Consent Order, the Respondent shall use best efforts to ensure that the Site is secure and that, pursuant to R 299.4128(1), illegal dumping does not occur at the Site.
- 3.2 Within sixty (60) days after the effective date of this Consent Order, the Respondent shall plug or cap the outlet tower identified in Attachment 2 and take all necessary actions to terminate any surface water discharge to the Cornwell Drain. The Respondent will not place the outlet tower back into service unless proper permits are acquired.

- 3.3 Within ninety (90) days after the effective date of this Consent Order, the Respondent shall submit to the ODWMA, for review and approval, an administratively complete Act 399 construction permit application for the reconstruction of the non-mechanical dewatering system for WTP residuals at the Site, including provisions and a schedule for the construction of a physical barrier that will separate the area proposed for the reconstructed dewatering system from the area where the other solid waste is located on the Site. The permit application will clearly identify any areas that will not be used as part of the reconstructed non-mechanical dewatering system and identify any slurry inlet points located outside the system footprint so such inlet points can be permanently capped by the Respondent. The permit application will also include a basis of design for the management of WTP residuals within the system.
- 3.4 Within ninety (90) days after the effective date of this Consent Order, the Respondent shall submit to the OWMRP, for review and approval, any portion of the dewatering system residuals management plan submitted to the ODWMA that is required to comply with Part 115.
- 3.5 Within two hundred and forty (240) days of the effective date of this Consent Order, the Respondent shall submit to the DEQ, for review and approval, a report that summarizes the current conditions at the Site ("Site Conditions Summary Report") or ("SCSR"). The SCSR shall include, at a minimum, the following:
- a. Identification of the horizontal and vertical extent of solid waste at the Site;
  - b. Estimates, in cubic yards, of the volumes of un-impacted concrete, lime, and other solid waste at the Site;
  - c. Characterization of the solid wastes at the Site including data to support the characterizations;
  - d. Identification, characterization, and delineation of any environmental contamination that is found at the Site;

- e. Identification of the general geologic and hydrogeologic conditions at the Site; and
  - f. Copies of any DEQ-approved inertness, other designations, and/or DEQ-approved "other beneficial reuse" authorizations obtained by the Respondent.
- 3.6 If the SCSR fails to delineate the horizontal and vertical extent of solid waste, or fails to delineate any contamination identified at the Site, or fails to support conclusions identified in the report, or is disapproved for other specified deficiencies, the Respondent shall develop and implement a remedial investigation. A complete and technically adequate work plan for a remedial investigation ("Remedial Investigation Work Plan") shall be submitted to the DEQ within sixty (60) days of the DEQ's notification that the Remedial Investigation Work Plan is necessary. Upon approval by the DEQ, the Respondent shall implement the Remedial Investigation Work Plan in accordance with the schedule contained therein. The Respondent shall submit, for review and approval by DEQ, final results and conclusions of the remedial investigation in the form of a written report ("Remedial Investigation Report") within thirty (30) days of completion of the remedial investigation.
- 3.7 If the DEQ-approved SCSR or Remedial Investigation Report identifies no environmental contamination above applicable criteria at the Site and the only issue to address is the presence of solid waste identified at the Site, the Respondent may elect to remove and properly dispose of the solid waste identified at the Site by completing the following requirements:
- a. Within thirty (30) days of receipt of written approval of the SCSR or Remedial Investigation Report by the DEQ, the Respondent shall submit to the DEQ for review and approval, a Solid Waste Removal Plan ("SWRP") for the Site. This plan will provide details regarding the proposed removal and legal disposal of the solid waste identified at the Site. In addition, the plan shall include a proposed schedule for the waste removal and disposal and a proposed waste removal confirmation plan.

- b. Within sixty (60) days of completion of the SWRP, the Respondent shall submit to the DEQ, for review and approval, a Solid Waste Removal Report for the Site. This report will contain summaries of waste volumes, final disposition of wastes, copies of landfill receipts, copies of paperwork required by "other beneficial reuse" authorizations, and waste removal confirmation sampling results.
- 3.8 If the Respondent identifies environmental contamination above applicable criteria and/or elects to leave the solid waste in place at the Site, then the Respondent shall complete the requirements of Paragraphs 3.9 through 3.12, as follows:
- 3.9 The Respondent shall submit to the DEQ, for review and approval, an Assessment of Corrective Measures ("ACM") that is in accordance with R 299.4443 of the Part 115 Rules within ninety (90) days of written approval by the DEQ of the Remedial Investigation Report. The ACM shall include an analysis of each potential remedy considered, identify the final remedial action proposed by the Respondent, and provide an explanation of how that proposed remedial action will meet applicable cleanup criteria of Part 201 and be in compliance with Part 115 and the Part 115 Rules.
- 3.10 The Respondent shall submit to the DEQ, for review and approval, a complete and technically adequate Remedial Action Plan ("RAP") for the Open Dump that is in compliance with the requirements of R 299.4444 of the Part 115 Rules within one hundred twenty (120) days of receipt of written approval by the DEQ of the ACM. The RAP shall include a detailed schedule for implementation and a FAM, if required. The RAP shall be consistent with the results of the remedial investigation and any other monitoring data collected, reports submitted, and/or investigations conducted prior to submittal of the RAP. The RAP, when implemented, shall comply with the applicable cleanup criteria of Part 201 and, upon approval of the plan by the DEQ, the Respondent shall implement the approved RAP in accordance with the schedule contained therein.
- 3.11 If, in accordance with the approved ACM, the Respondent elects to cap and close in-place the solid waste identified at the Site, the Respondent shall, as part of the RAP, submit to the DEQ, for review and approval, a Capping and Closure Plan and schedule for implementation ("CCP") and a Postclosure Plan and schedule for implementation ("PCP") for the Site that are in compliance with the requirements of R 299.4425 and

R 299.4447, respectively, of the Part 115 Rules and Part 115 to the extent required. Upon DEQ approval of the CCP and the PCP, the Respondent shall implement the plans in accordance with the schedules contained therein. If the Respondent lacks the expertise and/or manpower to conduct the work in accordance with the DEQ-approved CCP, the PCP, and the Part 115 Rules, the Respondent shall contract the work to be performed by a qualified contractor.

- 3.12 If, in accordance with an approved ACM, the Respondent elects to cap and close in-place the solid waste identified at the Site, the Respondent shall, as part of the RAP, submit to the DEQ, for review and approval, a Hydrogeologic Monitoring Plan and monitoring schedule ("HMP") for the Site that complies with R 299.4904, R 299.4905, R 299.4906, R 299.4907, and R 299.4908 of the Part 115 Rules, if required. Upon approval by the DEQ, the Respondent shall implement the HMP in accordance with the schedule contained therein. In addition, the Respondent may be required to provide appropriate financial assurance as required by Part 115.
- 3.13 The Respondent has chosen to use its WTP to supply water to its customers and discontinue using the city of Detroit Water and Sewerage Department ("DWSD") after receipt of a notice of termination of service from DWSD. In order for the Respondent to continue to use the WTP, the Respondent must undertake the KWA public improvement project or undertake other public improvement projects to continue to use the Flint River, such as additional WTP public improvements, source water protection public improvements, and public improvements to obtain a back-up water supply, in order to comply with Act 399.

#### IV. DEQ APPROVAL OF SUBMITTALS

- 4.1 For any work plan, proposal, or other document, excluding applications for permits or licenses, that are required by this Consent Order to be submitted to the DEQ by the Respondent, the following process and terms of approval shall apply.
- 4.2 To be approved by the DEQ, any work plan, proposal, or other document required to be submitted by this Consent Order shall include all of the information required by the

applicable statute and/or rule and all of the information required by the applicable paragraph(s) of this Consent Order.

- 4.3 Upon DEQ approval, or approval with modifications, of a work plan, proposal, or other document, such work plan, proposal, or other document shall be incorporated by reference into this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.
- 4.4 In the event the DEQ disapproves a work plan, proposal, or other document, it shall notify the Respondent, in writing, of the specific reasons for such disapproval. The Respondent shall submit, within sixty (60) days of receipt of such disapproval, a revised work plan, proposal, or other document that adequately addresses the reasons for the DEQ's disapproval.
- 4.5 In the event the DEQ approves with specific modifications, a work plan, proposal, or other document, it shall notify the Respondent, in writing, of the specific modifications required to be made to such work plan, proposal, or other document prior to its implementation and the specific reasons for such modifications. The DEQ may require the Respondent to submit, prior to implementation and within sixty (60) days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document that adequately addresses such modifications.
- 4.6 A finding of approval or approval with modification of a submission shall not be construed to mean that the DEQ concurs with any of the conclusions, methods, or statements in the submission or warrants that the submission comports with law.
- 4.7 Failure by the Respondent to submit an approvable work plan, proposal, or other document within the applicable time period specified above shall subject the Respondent to the enforcement provisions of this Consent Order including, but not limited to, the stipulated penalty provisions commencing on the date the revised work plan, proposal, or other document was due and accumulating until an approvable work plan, proposal, or other document is submitted.

- 4.8 Any delays caused by the Respondent's failure to submit an approvable work plan, proposal, or other document when due shall in no way affect or alter the Respondent's responsibility to comply with any other deadline(s) specified in this Consent Order.
- 4.9 No informal advice, guidance, suggestions, or comments by staff of the DEQ regarding reports, work plans, proposals, plans, specifications, schedules, or any other writing submitted by the Respondent will be construed as relieving the Respondent of its obligation to obtain written approval of the DEQ if and when required by this Consent Order.

#### V. MODIFICATIONS AND EXTENSIONS

- 5.1 At the request of the Respondent, a work plan, proposal, or other document approved or approved with specific modifications by the DEQ, with the exclusion of the specified deadlines set forth in Section III, Compliance Program, of this Consent Order, may be modified by the OWMRP Lansing District Supervisor. Any modifications or extensions in regard to the Act 399 construction permit must be approved by the ODWMA Lansing District Supervisor
- 5.2 The Respondent and the DEQ agree that the Office Chief may, but in no circumstances is obligated to, grant the Respondent an extension of the specified deadlines set forth in this Consent Order. Any extension shall be preceded by a timely written request, received by the DEQ no later than ten (10) business days prior to the pertinent deadline, which shall include:
- a. An identification of the specific deadline(s) of this Consent Order that will not be met.
  - b. A detailed description of what will prevent the Respondent from meeting the deadline(s).
  - c. A description of the measures the Respondent has taken and/or intends to take to meet the required deadline(s).



- d. The length of the extension requested and the specific date(s) on which the obligation(s) will be met.
- 5.3 The Office Chief shall respond promptly to such requests and shall not unreasonably withhold approval for such requests.
- 5.4 Any extension of the specified deadlines or other modifications and amendments of this Consent Order shall require a formal written amendment of this Consent Order, shall be signed by the Respondent and the DEQ ("Parties"), shall have as their effective date the date on which they are signed by the Office Chief, and shall be incorporated into and become an enforceable part of this Consent Order.

#### VI. REPORTING

- 6.1 With the exception of the Act 399 construction permit application required by Paragraph 3.3 of this Consent Order, the Respondent shall submit all items required in Section III, Compliance Program, to the Lansing District Supervisor, OWMRP, DEQ, P.O. Box 30242, Lansing, Michigan 48909-7742, unless specifically directed otherwise within this Consent Order. The Respondent shall submit the Act 399 construction permit application required by Paragraph 3.3 of this Consent Order and any documents that pertain to, or are required by, the Act 339 application or permit to the Lansing District Supervisor, ODWMA, DEQ, P.O. Box 30242, Lansing, Michigan 48909-7742. The cover letter with each submittal shall identify the specific paragraph and requirement of this Consent Order that the submittal is intended to satisfy. If the address of a District Supervisor changes, the Respondent will be notified and shall make all subsequent submittals to any new address of which they are notified.
- 6.2 The Respondent shall verbally report any violation(s) of the terms and conditions of this Consent Order to the OWMRP District Supervisor by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with a written report within five (5) business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), the precise cause or causes of the violation(s), a detailed description of any action(s) taken or proposed to correct the violation(s), and a schedule for the implementation of any

proposed corrective action(s). The Respondent shall report any anticipated violation(s) of this Consent Order to the OWMRP District Supervisor in advance of the relevant deadlines, whenever possible.

#### VII. RETENTION OF RECORDS

- 7.1 Upon request by an authorized representative of the DEQ, the Respondent shall make available to the DEQ all records, plans, logs, and other documents required to be maintained under this Consent Order, or pursuant to Part 115, the Part 115 Rules, Act 399, or the Act 399 Rules. Within 30 days of the effective date of this Consent Order, the Respondent shall designate, in writing, a location for retention of all such documents that is accessible to DEQ staff within normal business hours. All such documents shall be retained at the designated location for at least a period of three (3) years from the date of generation of the record unless a longer period of record retention is required by Part 115, the Part 115 Rules, Act 399, or the Act 399 Rules. If the designated location changes, the Respondent shall provide written notice of such to the DEQ.

#### VIII. RIGHT OF ENTRY

- 8.2 The Respondent shall allow any authorized representative or contractor of the DEQ, upon presentation of proper credentials, to enter upon the premises of the Site at all reasonable times for the purpose of monitoring compliance with the provisions of this Consent Order. This paragraph in no way limits the authority of the DEQ to conduct tests and inspections pursuant to the NREPA and its rules or any other applicable statutory provision.

#### IX. FINES, COSTS, AND PENALTIES

- 9.1 Within thirty (30) days of the effective date of this Consent Order, the Respondent shall pay the sum of \$2,500 to the State of Michigan in settlement of the DEQ's claim for civil fines arising from the violations alleged in the above-referenced LOWs and Compliance Communications.

- 9.2 For each failure to comply with the provisions of Section III, Compliance Program, of this Consent Order, the Respondent shall pay to the State of Michigan stipulated penalties in an amount of \$100 per violation per day for one (1) through seven (7) days of violation; \$250 per violation per day for eight (8) through fourteen (14) days of violation; and \$500 per violation per day for each day of violation thereafter. Stipulated penalties shall be paid within thirty (30) days after receiving a written demand made by the DEQ.
- 9.3 To ensure timely payment of any civil fines, penalties, and costs due under this Consent Order, the Respondent shall pay an interest penalty to the State of Michigan each time the Respondent fails to make a complete or timely payment. This interest penalty shall be based on the rate set forth at Section 6013(6) of the Revised Judicature Act, 1961 PA 236, as amended, MCL 600.6013(6), using the full increment of amount due as principal, and calculated from the due date for the payment until the delinquent payment is finally made in full.
- 9.4 The Respondent shall make all payments due under this Consent Order by certified or cashier's check made payable to the "State of Michigan" and mailed to the DEQ, Revenue Control Unit, P.O. Box 30657, Lansing, Michigan 48909-8157, or hand delivered to the DEQ, Revenue Control Unit, 1<sup>st</sup> Floor, Van Wagoner Building, 425 West Ottawa Street, Lansing, Michigan 48933. To ensure proper credit, all payments made pursuant to this Consent Order must include Payment Identification Number RMD40016 on the front of the check and/or in the cover letter with the payment.
- 9.5 The Respondent agrees not to contest the legality of the civil fine or the costs of surveillance and enforcement paid pursuant to this section. The Respondent further agrees not to contest the legality of any stipulated penalties or interest penalties assessed pursuant to this section but reserves the right to dispute the factual basis upon which a demand by the DEQ for stipulated penalties or interest penalties is made.
- 9.6 Liability for or payment of stipulated penalties pursuant to this Consent Order shall not preclude the State of Michigan from seeking injunctive relief or other relief for the Respondent's failure to comply with the requirements of this Consent Order and/or any permit(s) or license(s) required to comply with this Consent Order.

## X. DISPUTE RESOLUTION

- 10.1 Unless otherwise provided in this Consent Order, the dispute resolution procedures of this section shall be the exclusive mechanism to resolve disputes arising under, or with respect to, this Consent Order and shall apply to all provisions of this Consent Order. However, the procedures set forth in this section shall not apply to actions by the state of Michigan to enforce obligations of the Respondent that have not been disputed in accordance with this section. Engagement of a dispute resolution between the Parties shall not be cause for the Respondent to delay the performance of any compliance requirements or response activity. Any dispute that arises under this Consent Order shall in the first instance be the subject of informal negotiations between the Parties. The period of negotiations shall not exceed twenty (20) days from the date of written notice by any Party that a dispute has arisen, unless the time period for negotiations is modified by written agreement between the Parties. The dispute shall be considered to have arisen when one Party sends the other Party a written notice of dispute. If agreement cannot be reached on any issue within this twenty- (20-) day period, the DEQ shall provide a written statement of its decision to the Respondent and, in the absence of initiation of formal dispute resolution by the Respondent under Paragraph 10.2, the DEQ position, as outlined in its written statement of decision, shall be binding on the Parties.
- 10.2 If the Respondent and DEQ cannot informally resolve a dispute under Paragraph 10.1, the Respondent may initiate formal dispute resolution by requesting a review of the disputed issues by the Office Chief. This written request must be filed with the Office Chief within fifteen (15) days of the Respondent's receipt of the DEQ's statement of decision that is issued at the conclusion of the informal dispute resolution procedure set forth in Paragraph 10.1. The Respondent's request shall state the issues in dispute; the relevant facts upon which the dispute is based; any factual data, analysis, or opinion supporting its position; and all supporting documentation upon which the Respondent bases its position. Within fourteen (14) days of the Office Chief's receipt of the Respondent's request for a review of disputed issues, the Office Chief will provide a written statement of decision to the Respondent, which will include a statement of his/her understanding of the issues in dispute; the relevant facts upon which the dispute is based; any factual data, analysis, or opinion supporting her/his position; and all

supporting documentation relied upon by the Office Chief's review of the disputed issues. The Office Chief's review of the disputed issues may be extended by written agreement of the Parties.

- 10.3 The written statement of the Office Chief issued under Paragraph 10.2 shall be binding on the Parties unless, within fifteen (15) days after receipt of the DEQ's written statement of decision, the Respondent files a petition for judicial review in a court of competent jurisdiction that shall set forth a description of the matter in dispute, the efforts made by the Parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Order. Nothing in this Consent Order affects the limitations on the timing of judicial review of the DEQ decision regarding the selection, extent, or adequacy of any response activity.
- 10.4 An administrative record of the dispute shall be maintained by the DEQ. The administrative record shall include all of the information provided by the Respondent pursuant to Paragraph 10.1, as well as any other documents relied upon by the DEQ in making its final decision pursuant to Paragraph 10.2. Where appropriate, the DEQ shall allow submission of supplemental statements of position by the Parties to the dispute.
- 10.5 In proceeding on any dispute, the Respondent shall have the burden of demonstrating on the administrative record that the position of the DEQ is arbitrary and capricious or otherwise not in accordance with law. In proceedings on any dispute initiated by the Respondent, the Respondent shall bear the burden of persuasion on factual issues.
- 10.6 Notwithstanding the invocation of dispute resolution proceedings, stipulated penalties shall accrue from the first day of any failure or refusal to comply with any term or condition of this Consent Order, but payment shall be stayed pending resolution of the dispute. Stipulated penalties shall be paid within thirty (30) days after the resolution of the dispute. The Respondent shall pay that portion of a demand for payment of stipulated penalties that is not subject to dispute resolution procedures in accordance with and in the manner provided in Section IX, Fines, Costs, and Penalties, of this Consent Order.

## XI. FORCE MAJEURE

- 11.1 The Respondent shall perform the requirements of this Consent Order within the time limits established herein unless performance is prevented or delayed by events that constitute a "Force Majeure." Any delay in the performance attributable to a "Force Majeure" shall not be deemed a violation of the Respondent's obligations under this Consent Order in accordance with this section.
- 11.2 For the purpose of this Consent Order, "Force Majeure" means an occurrence or nonoccurrence arising from causes not foreseeable, beyond the control of, and without the fault of the Respondent, such as: an Act of God, untimely review of permit applications or submissions by the DEQ or other applicable authority, and acts or omissions of third parties that could not have been avoided or overcome by the Respondent's diligence and that delay the performance of an obligation under this Consent Order. "Force Majeure" does not include, among other things, unanticipated or increased costs, changed financial circumstances, or failure to obtain a permit or license as a result of the Respondent's actions or omissions.
- 11.3 The Respondent shall notify the DEQ, by telephone, within forty-eight (48) hours of discovering any event that causes a delay in its compliance with any provision of this Consent Order. Verbal notice shall be followed by written notice within ten (10) calendar days and shall describe, in detail, the anticipated length of delay, the precise cause or causes of delay, the measures taken by the Respondent to prevent or minimize the delay, and the timetable by which those measures shall be implemented. The Respondent shall adopt all reasonable measures to avoid or minimize any such delay.
- 11.4 Failure of the Respondent to comply with the notice requirements of Paragraph 11.3, above, shall render this section void and of no force and effect as to the particular incident involved. The DEQ may, at its sole discretion and in appropriate circumstances, waive the notice requirements of Paragraph 11.3.
- 11.5 If the Parties to this Consent Order agree that the delay or anticipated delay was beyond the control of the Respondent, this may be so stipulated and the Parties to this Consent Order may agree upon an appropriate modification of this Consent Order. If the Parties

to this Consent Order are unable to reach such agreement, the dispute shall be resolved in accordance with Section X, Dispute Resolution. The burden of proving that any delay was beyond the reasonable control of the Respondent, and that all the requirements of this section have been met by the Respondent, is on the Respondent.

- 11.6 An extension of any given compliance date based upon a particular incident does not necessarily mean that the Respondent qualifies for an extension of a subsequent compliance date without providing proof regarding each incremental step or other requirement for which an extension is sought.

## XII. GENERAL PROVISIONS

- 12.1 With respect to any violations not specifically addressed and resolved by this Consent Order, the DEQ reserves the right to pursue any other remedies to which it is entitled for any failure on the part of the Respondent to comply with the requirements of any state or federal law, including the NREPA and its rules.
- 12.2 Execution of the schedule contained in this Consent Order shall not be construed to waive, estop, or otherwise diminish the DEQ's right to seek or impose civil liability upon, and seek appropriate relief from, the Respondent for degradation of waters of the State and the designated uses thereof arising out of the failure of the Respondent to achieve a proper cleanup pursuant to this Consent Order.
- 12.3 This Consent Order does not constitute a warranty or representation of any kind by the DEQ that the response activities performed in accordance with this Consent Order or DEQ-approved work plans will result in the achievement of the remedial criteria established by law, or that the response activities will ensure protection of public health, safety, or the environment.
- 12.4 This Consent Order in no way affects the Respondent's responsibility to comply with any other applicable local, state, or federal laws or regulations including, without limitation, any corrective action or similar requirements applicable to the Site pursuant to the NREPA and its rules.

- 12.5 Nothing in this Consent Order is or shall be considered to affect any liability the Respondent may have for natural resources damages caused by the Respondent's ownership and/or operation of the Site. The State of Michigan does not waive any rights to bring an appropriate action to recover such damages to the natural resources.
- 12.6 The Parties agree that the terms and conditions of this Consent Order will be enforceable in circuit court. The Parties further agree that the appropriate venue for the enforcement of this Consent Order shall be the Circuit Court for Genesee County or the Circuit Court for Ingham County, State of Michigan, which courts shall also be appropriate for dispute resolution.
- 12.7 If any provision or authority of this Consent Order or the application of this Consent Order to any Party or circumstances is held by any judicial or administrative authority to be invalid, the application of such provisions to other Parties or circumstances and the remainder of the Consent Order shall remain in force and shall not be affected thereby.
- 12.8 The provisions of this Consent Order shall be binding on the Respondent, the DEQ, and their successors and assigns. The Respondent shall give notice of this Consent Order to any prospective successor in interest prior to transfer of ownership of the Site property or any portion thereof and shall notify the DEQ of such proposed sale or transfer.

### XIII. TERMINATION

- 13.1 This Consent Order shall remain in full force and effect until expressly terminated by a written Notice of Termination issued by the Office Chief. The Respondent may request that the Office Chief issue a written Notice of Termination at any time after achieving full compliance with this Consent Order. Such a request shall consist of a written certification that the Respondent has fully complied with all of the requirements of this Consent Order and has made payment of any fines, penalties, and costs required under this Consent Order. Specifically, this certification shall include:



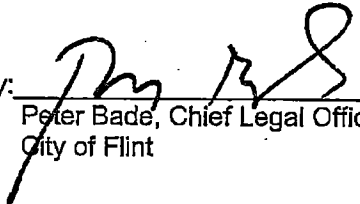
- a. The date of compliance with each provision of the Compliance Program in Section III of this Consent Order and the date any fines, penalties, or costs were paid;
- b. a statement that all required information has been reported to the District Supervisor;
- c. confirmation that all records required to be maintained pursuant to this Consent Order are being maintained by the City at the location designated pursuant to Paragraph 7.1 of this Consent Order; and
- d. additional relevant information requested by the Office Chief.

13.2 The Office Chief shall issue a written Notice of Termination unless the DEQ determines that the Respondent has not submitted the certification required under this section, has failed to submit the information specifically requested by the Office Chief, or has failed to comply with, or complete, all of the requirements of this Consent Order.

XIV. SIGNATORIES

The undersigned CERTIFY they are fully authorized by the party they represent to enter into this Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it.


CITY OF FLINT

By:   
Peter Bade, Chief Legal Officer  
City of Flint

Date: 3. 20. 14

DEPARTMENT OF ENVIRONMENTAL  
QUALITY

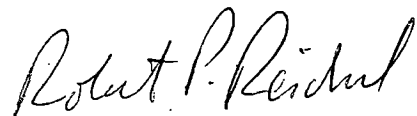
Dan Wyant  
Director

By:   
Bryce Feighner, Chief  
Office of Waste Management and  
Radiological Protection

Date: 3-20-2014

APPROVED AS TO FORM:

Bill Schuette  
Attorney General

  
Robert P. Reichel (P31878)  
Assistant Attorney General  
Environment, Natural Resources, and  
Agriculture Division  
Department of Attorney General  
P.O. Box 30755  
Lansing, Michigan 48909

Date: 3/20/14

STATE OF MICHIGAN



JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

*"Better Service for a Better Environment"*

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: [www.deq.state.mi.us](http://www.deq.state.mi.us)

RUSSELL J. HARDING, Director

REPLY TO:

WASTE MANAGEMENT DIVISION  
SHIAWASSEE DISTRICT OFFICE  
10650 BENNETT DR.  
MORRICE MI 48857-9792

April 9, 2001

Mr. Gary Bates  
Administrator, City of Flint  
1101 South Saginaw Street  
Flint, Michigan 48502-1416

Dear Mr. Bates:

SUBJECT: City of Flint, Department of Public Works (DPW)  
12<sup>th</sup> Street DPW Yard, Court Street DPW Yard, Bray Road Landfill  
Notice of Violation

Staff of the Department of Environmental Quality (DEQ), Waste Management Division (WMD), Shiawassee District Office conducted inspections at the City of Flint - 12<sup>th</sup> Street DPW Yard on March 20, 2001, and at the City of Flint - Court Street DPW Yard and Bray Road Landfill on March 28, 2001.

The following violations of Part 115, Solid Waste Management (Part 115) and Part 31, Water Pollution Control (Part 31), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451) were noted during the inspections:

12<sup>th</sup> Street DPW Yard

On March 20, 2001, the WMD conducted a follow-up inspection of the City of Flint - 12<sup>th</sup> Street Yard to investigate illegal waste piles at the facility and determined that the site was not in compliance with Part 115 and the Part 115 rules. Previous inspections by the DEQ, Storage Tank Division were done on May 16, 2000, June 20, 2000, and February 21, 2001, and by the DEQ Surface Water Quality Division on September 5, 2000.

The inspection on March 20, 2001 identified several large piles of solid waste consisting of street cleanings and construction and demolition rubble. This violates Part 115, Rules 299.4129(1) and 299.4102(k), Part 115, Section 11509(1), and Part 115, Sections 11512(1) and (2).

Rule 299.4129(1) states:

The storage of waste in a pile that is not contained in accordance with Rule 299.4130 constitutes disposal and requires a permit or license under the act. A waste pile that is required to have a permit or license under the act shall be in compliance with the hydrogeological report, groundwater monitoring, and groundwater performance standards

which are applicable to type III landfills and which are specified in part 3 of these rules (Part 115 rules).

Activities at the 12<sup>th</sup> Street DPW Yard constitute disposal of solid waste in accordance with the requirements of Rule 299.4102(k).

Rule 299.4102(k) states:

"Disposal" means any of the following:

- (i) The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste into or on any land or water so that the solid waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters. Disposal includes the placement of solid waste in an open dump, landfill, or waste piles that are not exempt under R 299.4129(2) or R 299.4130.
- (ii) The open burning or incineration of solid waste.
- (iii) The processing of solid waste.
- (iv) The storage or handling of solid waste at a solid waste transfer facility.
- (v) The abandonment of solid waste in place of other disposal.

Section 11509(1) states:

Except as otherwise provided in section 11529, a person otherwise allowed under this part to own or operate a solid waste disposal area shall not establish a disposal area without a construction permit from the department, contrary to an approved solid waste management plan, or contrary to a permit, license, or final order issued pursuant to this part.

Section 11512(1) states:

A person shall dispose of solid waste at a disposal area licensed under this part unless a person is permitted by state law or rules promulgated by the department to dispose of the solid waste at the site of generation.

Section 11512(2) states:

Except as otherwise provided in this section or in section 11529, a person otherwise allowed under this part to own or operate a solid waste disposal area shall not conduct, manage, maintain, or operate a disposal area within this state without a license from the department, contrary to an approved solid waste management plan, or contrary to a permit, license, or final order issued under this part.

The City of Flint must immediately remove the illegal waste piles and dispose the solid waste in a licensed Type II landfill (licensed under Part 115) in accordance with the applicable approved county solid waste management plans. The waste piles must be cleaned up by May 11, 2001. The City of Flint must provide the WMD Shiawassee District Office with landfill gate receipts to demonstrate that the solid waste was disposed of properly by the date indicated above.

During the March 28, 2001 inspection at the Court Street facility, City of Flint employees indicated that the street sweepings were being disposed at the Bray Road Landfill. Bray Road Landfill is not licensed under Part 115. Compliance issues regarding the Bray Road Landfill are addressed below.

### **Court Street DPW Yard**

On March 28, 2001, staff of WMD and Surface Water Quality Division conducted a follow up inspection of the City of Flint – Court Street DPW Yard to investigate an illegal waste pile and an illegal surface impoundment. The inspection revealed a surface impoundment where raw sewage from cleaning sanitary sewers was dumped, and a waste pile where grit from the cleanout of the primary clarifier at the City of Flint Waste Water Treatment Plant was dumped. The grit from the primary clarifier of the wastewater treatment plant is a solid waste. City of Flint employees said the raw sewage had been dumped in the pit on a continuing basis for several years. City of Flint employees said that the grit was dewatered and then it was being disposed of at the Bray Road Landfill.

The surface impoundment is a violation of Part 31, Sections 324.3109(1) and (2).

#### Section 3109(1) states:

A person shall not directly or indirectly discharge into the waters of the state a substance that is or may become injurious to any of the following:

- (a) To the public health, safety, or welfare.

#### Section 3109(2) states:

The discharge of any raw sewage of human origin, directly or indirectly, into any of the waters of the state shall be considered prima facie evidence of a violation of this part by the municipality in which the discharge originated unless the discharge is permitted by an order or rule of the department. If the discharge is not the subject of a valid permit issued by the department, a municipality responsible for the discharge may be subject to the remedies provided in section 3115. If the discharge is the subject of a valid permit issued by the department pursuant to section 3112, and is in violation of that permit, a municipality responsible for the discharge is subject to the penalties prescribed in section 3115.

The illegal waste pile is a violation of Part 115, Rules 299.4129(1) and 299.4102(k), Part 115, Section 11509(1), and Part 115, Sections 11512(1) and (2). Rule and Act citations were provided previously.

The City of Flint must immediately cease unpermitted discharge to the lagoon. Waste from the lagoon must be removed and disposed of in accordance with the requirements of Act 451. Final disposal of the raw sewage from the lagoon must be documented and provided to the WMD, Shiawassee District Office by April 27, 2001. After the sewage has been removed from the lagoon, the City of Flint must close the lagoon in accordance with the requirements of Part 31. A closure/remediation plan must be provided to the WMD, Shiawassee District Office by May 11, 2001.

The grit must be disposed of in accordance with the requirements of Part 115. The City of Flint must provide the WMD Shiawassee District Office with landfill gate receipts to document that the solid waste was disposed of properly. The grit must be properly disposed by May 11, 2001.

#### **Bray Road Landfill**

On March 28, 2001, staff of the WMD conducted a drive by inspection of the Bray Road Landfill. The landfill was accepting solid waste at the time of the inspection. City of Flint employees indicated that waste from the 12<sup>th</sup> Street DPW Yard and the Court Street DPW Yard was being actively disposed at the Bray Road Landfill. The employees indicated that the landfill had been active for about 15 years. The WMD has determined that the Bray Road Landfill is an illegal landfill because it has never had a permit or license issued under Part 115. For a landfill to be legal in the State of Michigan, it must be permitted and licensed under Part 115.

The Bray Road Landfill is in violation of Part 115, Rules 299.4128(1) and 299.4102(k) (placement of solid waste in an open dump), Part 115, Section 11509(1), and Part 115, Sections 11512(1) and (2). Rule and Act citations for Rule 299.4102(k), Section 11509(1) and Sections 11512(1) and (2) were provided previously.

#### **Rule 299.4128(1) states:**

A person shall not dispose of solid waste in an open dump, except as provided in the act.

Continuing the disposal activities detailed in this letter is unlawful. The City of Flint must immediately begin taking the solid waste it has generated to a disposal facility licensed under Part 115.

The City of Flint must provide a work plan that describes one of the options below by April 27, 2001:

1. Close the Bray Road Landfill in accordance with the Part 115 rules, after determining that there is no contamination associated with the landfill. If the City of Flint chooses this option in its work plan, then Closure and Post-closure plans must be submitted to the WMD Shiawassee District Office by June 8, 2001. The Closure and Post-closure plans must be

April 9, 2001

prepared in accordance with the requirements of Part 115, Rules 446 and 447. The closure and post-closure plans must include provisions for monitoring the closed area, remedial investigation and remediate the facility and groundwater impacted by the landfill, if necessary.

In addition, financial assurance for Closure and Post-closure care must be submitted for the Bray Road Landfill. Financial assurance documentation must be prepared in accordance with the requirements of Part 115, Sections 11523 and 11523a.

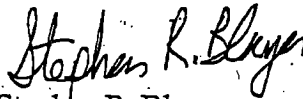
2. Remove all waste from the Bray Road Landfill and dispose the waste in a licensed landfill. Remediate any contamination associated with the landfill.

Be advised that the above-cited violations and/or continuation of these violations and any other violations constitute cause for the DEQ to institute enforcement actions as provided in Section 11546 and Section 11549 of Part 115. Said violations may be subject to civil and/or criminal fines, penalties, and costs.

Be further advised that compliance with the Notice of Violation does not constitute a release from, nor a waiver of, liabilities for any environmental damages or violations past or continuing of Act 451 and the rules promulgated thereunder.

Please call me if you have any questions regarding this Notice of Violation.

Sincerely,



Stephen R. Blayer  
Senior Environmental Engineer  
Waste Management Division  
517-625-4630.

cc: Ms. Molly Lamrouex, DEQ - Shiawassee  
Mr. Chuck Bennett, DEQ - Shiawassee  
Mr. John Craig, DEQ  
Mr. Frank Ruswick, DEQ



JOHN ENGLER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
SHIAWASSEE DISTRICT OFFICE



RUSSELL J. HARDING  
DIRECTOR

February 14, 2002

Mr. Darnell Earley  
1101 South Saginaw Street  
Flint, Michigan 48502-1416

Dear Mr. Early:

SUBJECT: 12th Street DPW site, Court Street Water Service Center, City of Flint Bray Road Landfill

On March 20, 2001 staff of the Department of Environmental Quality (DEQ), Waste Management Division (WMD), Shiawassee District Office conducted an inspections at the 12<sup>th</sup> Street Department of Public Works (DPW) site. On March 28, 2001 staff inspected 3310 E. Court Street Water Service Center site and the City of Flint Bray Road Landfill. The inspections found violations of Part 115, Solid Waste Management (Part 115) and Part 31, Water Resources Protection (Part 31) of the Natural resources and Environmental Protection Act, 1994 PA 451 as amended (Act 451).

A letter detailing the violations was sent to Mr. Bates, City of Flint Administrator, on April 9, 2001. The letter requested that the City of Flint respond by April 27, 2001 with a plan to bring the affected sites in to compliance with Act 451. The City of Flint failed to respond to this letter of warning. Attached for your information is a copy of that letter.

On February 7, 2002, staff of WMD again conducted inspections of the three City of Flint sites. The inspection of the 12<sup>th</sup> Street DPW site found that the waste piles consisting of street cleanings and construction and demolition debris had been removed and disposed in a licensed landfill according to staff at the site. The inspection of the Court Street Water Service Center did not find evidence of an illegal waste pile or an impoundment being used as a disposal area for raw sewage. The inspection did find a pile of road salt stored uncovered on the ground.

The Court Street Water Service Center site is considered an On-land facility as described in Part 5, Spillage of Oil and Polluting Materials of Part 31 of Act 451.

- (g) "On-land facility" means a temporary or permanent land-based industry, plant, establishment, firm, storage site, or other facility, which receives, processes, manufactures, uses, stores or ships polluting materials and at which there is present an amount of any polluting material equal to or more than its threshold management quantity and which is so situated that loss of polluting materials could directly or indirectly reach the surface or groundwaters of this state, including any facility which discharges through a public sewer system. "On-land facility" does not include an oil storage facility, an oil field petroleum or brine storage facility, a recreational marina, installations of oil containing electrical equipment, or a transportation-related facility as defined in 40 C.F.R. part 112.



Salt is a polluting material as defined in the Part 5 Rules:

Rule 324.2002

(a) "Polluting material" means all of the following:

- (i) Oil.
- (ii) Salt

The storage of salt uncovered and on the ground is a violation of the following rule requirement of Part 5:

Rule 4. Oil storage and on-land facilities shall maintain adequate surveillance of all manufacturing processes, treatment systems, storage areas, and other such areas so that any polluting material loss there from can be detected in a timely manner and procedures implemented to prevent any polluting materials from reaching the waters of this state.

As discussed with staff of the Water Service Center, the salt must be removed from the ground, covered and stored on an impervious surface. The City of Flint must take action to correct this violation.

During the inspections performed in March of 2001, City of Flint employees indicated that waste from the 12<sup>th</sup> Street DPW Yard and the Court Street DPW Yard was being actively disposed at the Bray Road Landfill. The employees indicated that the landfill had been active for at least 15 years.

During the inspection of February 7, 2002, staff of the 12<sup>th</sup> Street DPW assured staff of the DEQ that solid waste resulting from operations at this site is no longer being disposed at the Bray Road Landfill. However, during the inspection of the Water Service Center site staff of that facility informed DEQ staff that debris that results from repairing water main ruptures in the City of Flint, continues to be taken to the Bray Road Landfill. The City of Flint was informed in the letter from the DEQ dated, April 9, 2002, that the Bray Road Landfill is an illegal landfill. Solid waste resulting from any City of Flint activity must not be disposed at the Bray Road site.

The WMD previously determined that the Bray Road Landfill is an illegal landfill since no permit or license has been issued in accordance with Part 115 requirements. For a landfill to operate in the state of Michigan, it must be permitted and licensed under Part 115.

The Bray Road Landfill is still in violation of the following Part 115 requirements that were cited previously.

Sec. 11509 (1) Except as otherwise provided in section 11529, a person otherwise allowed under this part to own or operate a solid waste disposal area shall not establish a disposal area without a construction permit from the department, contrary to an approved solid waste management plan, or contrary to a permit, license, or final order issued pursuant to this part. A person proposing the establishment of a disposal area shall apply for a construction permit to the department through the health officer on a form provided by the department. If the disposal area is located in a county or city that does not have a certified health department, the application shall be made directly to the department.

Sec. 11512. (1) A person shall dispose of solid waste at a disposal area licensed under this part unless a person is permitted by state law or rules promulgated by the department to dispose of the solid waste at the site of generation.

(2) Except as otherwise provided in this section or in section 11529, a person otherwise allowed under this part to own or operate a solid waste disposal area shall not conduct, manage, maintain, or operate a disposal area within this state without a license from the department, contrary to an approved solid waste

management plan, or contrary to a permit, license, or final order issued under this part. A person who intends to conduct, manage, maintain, or operate a disposal area shall submit a prior license application to the department through a certified health department on a form provided by the department. If the disposal area is located in a county or city that does not have a certified health department, the application shall be made directly to the department. A person authorized by this part to operate more than 1 type of disposal area at the same facility may apply for a single license.

299.4102(k) "Disposal" means any of the following:

(i) The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste into or on any land or water so that the solid waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

Rule 299.4128(1) A person shall not dispose of solid waste in an open dump, except as provided in the act.

The continuing disposal activities detailed in this letter is unlawful. The City of Flint must cease taking waste to the Bray Road Landfill and direct all solid waste it has generated to a licensed Part 115 disposal facility.

The City of Flint must provide the DEQ a work plan that describes one of the options below.

1. Close the Bray Road Landfill in accordance with the Part 115 rules, after determining that there is no contamination associated with the landfill. If the City of Flint chooses this option in its work plan, then Closure and Post-closure plans must be submitted to the WMD Shiawassee District Office by June 8, 2002. The Closure and Post-closure plans must be prepared in accordance with the requirements of Part 115, Rules 446 and 447. The closure and post-closure plans must include provisions for monitoring the closed area, remedial investigation and remediate the facility and groundwater impacted by the landfill, if necessary.

In addition, financial assurance for Closure and Post-closure care must be submitted for the Bray Road Landfill. Financial assurance documentation must be prepared in accordance with the requirements of Part 115, Sections 11523 and 11523a.

2. Remove all waste from the Bray Road Landfill and dispose the waste in a licensed landfill. Remediate any contamination associated with the landfill.

Be advised that the above-cited violations and/or continuation of these violations and any other violations may constitute cause for the DEQ to institute enforcement actions as provided in:

Sec. 324.11546

(1) The department or a health officer may request that the attorney general bring an action in the name of the people of the state, or a municipality or county may bring an action based on facts arising within its boundaries, for any appropriate relief, including injunctive relief, for a violation of this part or rules promulgated under this part.

(2) In addition to any other relief provided by this section, the court may impose on any person who violates any provision of this part or rules promulgated under this part or who fails to comply with any permit, license, or final order issued pursuant to this part a civil fine of not more than \$10,000.00 for each day of violation.

(3) In addition to any other relief provided by this section, the court may order a person violating this part or the rules promulgated under this part either to restore or to pay to the state an amount equal to the cost of restoring the natural resources of this state affected by the violation to their original condition before the violation, and to pay to the state the costs of surveillance and enforcement incurred by the state as a result of the violation.

Sec. 324.11549 Violation as misdemeanor; penalty; separate offenses.

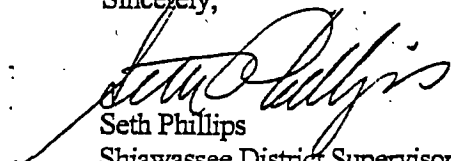
A person who violates this part, a rule promulgated under this part, or a condition of a permit, license, or final order issued pursuant to this part is guilty of a misdemeanor punishable by a fine of not more than \$1,000.00 for each violation and costs of prosecution and, if in default of payment of fine and costs, imprisonment for not more than six (6) months. Each day upon which a violation occurs is a separate offense.

The City of Flint must submit a written letter of response, to the salt storage violation found at the Court Street Water Service Center site and a work plan to address the violations at the Bray Road landfill by March 15, 2002.

This Letter of Warning does not preclude nor limit the DEQ's ability to initiate other enforcement action, under State or Federal Law, as deemed appropriate.

If you have any questions, contact Mr. Rich Brim at 517-625-4636 or me at the number indicated below.

Sincerely,

  
Seth Phillips  
Shiawassee District Supervisor  
Waste Management Division  
517-625-4632

Attachment

cc: Mr. Roger Clapp, City of Flint  
Mr. Mike Brown, City of Flint  
H. Jack Sargent, City of Flint  
Mr. Rich Brim, DEQ



JOHN ENGLER, Governor

## DEPARTMENT OF ENVIRONMENTAL QUALITY

HOLLISTER BUILDING, PO. BOX 30473, LANSING MI 48909-7973

INTERNET: <http://www.deq.state.mi.us>

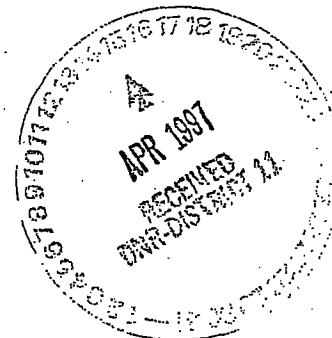
RUSSELL J. HARDING, Director

REPLY TO:

SHIAWASSEE DISTRICT OFFICE  
10650 S BENNETT DR  
MORRICE MI 48857-9792JW  
GenCo  
General File

April 15, 1997

City of Flint  
Department of Public Works and Utilities  
Attn: Mr. Clarence Dishman, Supervisor  
Water Service Center  
3310 Court Street  
Flint, MI 48506



Dear Mr. Dishman:

Thank you for the opportunity to meet on Thursday, April 10, 1997, to discuss the steps you have taken to resolve the concerns brought to our attention by Ms. Sheryl Merriam, Safety Mediator, Water Service Center. Thank you also for the tour of the facility and the explanation of how storm catch basin material and, to a lesser extent, sanitary sewage sludge is now handled.

As I understand your current policy, all sanitary sewage sludge is accepted by the landfill operated by Citizens Disposal in Grand Blanc Township. It is transported in the vactor trucks to the disposal facility and the trucks are flushed at the sludge delivery site with clean water prior to returning to service. As I understand your current policy concerning storm and street drain catch basin material, this material is brought to the yard at 3310 Court Street and off loaded from the vactor trucks, and temporarily stored in the yard while being scheduled for disposal. You advised me at the time of my visit that the disposal site was on City-owned property located on the west side of Bray Road, north of Carpenter Road, in Section 20 of Genesee Township.

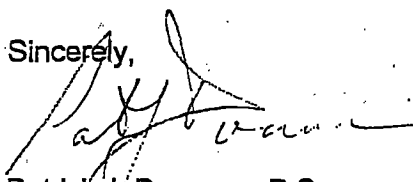
Depending upon moisture content, catch basin material is classified as either solid waste or as liquid industrial waste. I understand it is your policy to incorporate additional clean soil from other DPW activities into the catch basin material to insure that all the material is solid waste and that there are no liquid industrial waste disposal requirements to fulfill. As such, you have obligations to dispose of the solid waste in accordance with the Michigan Natural Resources and Environmental Protection Act, Act 451 of 1995, as amended (NREPA). Specifically, Part 115 of the NREPA requires that solid waste be disposed of at a Type II Sanitary Landfill. An exception for solids from catch basins requires a designation of inertness to be on file with the Michigan Department of Environmental Quality (MDEQ), Waste Management Division (WMD). I have reviewed this matter with the WMD in Shiawassee District. There is no inertness designation on file for the City of Flint storm catch basin materials, and the current disposal site is not licensed as a Type II sanitary landfill.

April 15, 1997

In order to comply with the requirements of the NREPA, it will be necessary for the City of Flint to transport solid waste (catch basin solids) to a licensed Type II sanitary landfill. You must discontinue dumping solid waste at the facility in Section 20 of Genesee Township. I have enclosed guidelines describing Best Management Practices (BMP) for servicing catch basins.

Please provide me written confirmation that my understanding of your current policy is correct. If you wish to further discuss this matter, or you desire additional information, please feel free to contact me.

Sincerely,



Patrick J. Donovan, R.S.  
Environmental Quality Analyst  
Environmental Response Division  
517-625-4641

enclosures

cc: ✓ Ms. Elizabeth Browne, MDEQ-WMD  
Mr. Mike Bray, MDEQ-SWQD  
Ms. Sheryl Merriam, City of Flint  
Mr. Nick Hoffman, Genesee County Health Dept.



JOHN ENGLER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
SHIAWASSEE DISTRICT OFFICE



RUSSELL J. HARDING  
DIRECTOR

April 19, 2002

#2310

Mr. Hans J. Kuhlmann, P.E.  
Deputy Director  
Flint Department of Public Works and Utilities  
1101 South Saginaw Street  
Flint, Michigan 48502

Dear Mr. Kuhlmann:

SUBJECT: Bray Road Site

This letter is in response to your letter of March 26, 2002, in regard to the City of Flint's concerns in regard to meeting the Department of Environmental Quality (DEQ) requirements for addressing the improper disposal activities that have occurred at the Bray Road site.

Your letter indicates concern with being able to determine the cost of solid waste removal, versus capping of the Bray Road site. As was stated in the letter from this office dated March 22, 2002 in response to your initial proposal to remove waste from the site, the City of Flint must remove all surface solid waste, as surface wastes are removed; additional wastes are likely to be exposed. Any additional waste discovered must be removed until natural subsurface soils are encountered. Alternatively, if the City wishes to leave some or all waste in place, the facility must be properly closed as a landfill in accordance with DEQ requirements. The approach the City intends to take needs to be stated by the City along with commitments to specific dates and milestones toward implementing the selected approach. If changes to the selected approach are later determined to be needed, those changes can be discussed at that time.

To determine the extent of contamination at the site, the City of Flint must conduct soil borings with soil sampling, and install monitoring wells, to sample for any potential contamination that may have resulted from the improper disposal activities. The letter, dated March 15, 2002, from the City of Flint, did not provide potential sampling locations, justifications for selecting these locations, analyses to be performed, or other information necessary for the DEQ to determine the adequacy of the proposed work, or to be able to determine whether contamination has occurred. While we understand that these details take some time to develop, the City of Flint needs to commit to a timetable to develop and implement these work details and obtain DEQ approval for proposed work. The

City of Flint must provide this information to the DEQ in a work plan, including time frames for when the work will be completed. The City must commit to a date for the development and submittal of this work plan for DEQ review and approval.

In your response, you acknowledged that the Inert Material Notification Form must be submitted by the City of Flint for disposal of inert concrete wastes at the site. The City of Flint must submit the form along with the work plan described above. In addition to submittal of the form, the work plan must provide the DEQ a plan for proper management of the concrete on site, (proof that any concrete that will remain on site is not contaminated or does not contain exposed rebar, what the City will do with materials that are not inert) or alternatively provide a plan for removal of any concrete from the site, to be disposed or used in land reclamation or stabilization in compliance with Part 115, Solid Waste Management (Part 115), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, (Act 451).

Your letter indicates there is no surface water discharge from the site and the water treatment residuals pumped to Bray Road are contained within the site or evaporate. Since the discharge is to an unlined lagoon, it is very unlikely that all the water evaporates. It is very likely that some of the water discharges to the groundwater, a discharge for which there is no state authorization.

The City of Flint needs to provide for proper management of water treatment sludges that have been disposed in the solid waste disposal area at the site. If the sludges are to be removed, the City needs to manage the material either through approved land application or via disposal at a licensed disposal area. If the City of Flint wishes to manage this material on site as inert, an application must be made to obtain a Designation of Inertness from the DEQ. With this application, the City of Flint must submit all appropriate testing results for the material and a justification for leaving the material on-site. The date that this application and testing results will be submitted by the City of Flint must be included in the site work plan.

For information on submittal requirements for inertness designations, contact Mr. Duane Roskoskey of the Waste Management Division of the DEQ at 517-335-4712. If analytical results do not support a Designation of Inertness for this material, the City of Flint may be required to remove the material or cap the material in accordance with Part 115 requirements.

Your letter also indicated that outcomes may vary, depending on if the State of Michigan appoints a receiver or if the Flint City Council approves the project. While there may be some mitigating factors in the future in regard to how the project proceeds, a work plan is required that includes definite, reasonable time frames in which the work will be completed. If events occur that necessitate changes as to when work will be completed, this can be addressed in the future.

Mr. Hans J. Kuhlmann, P.E.

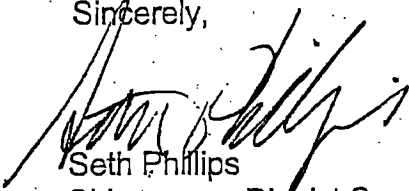
- 3 -

April 19, 2002

Your response and work plan must include a commitment from the City of Flint to take any remedial actions that may be necessary in the event that contamination of the site is found to have occurred.

The information indicated above must be provided to this office by May 17, 2002. If you have any questions, please contact Mr. Richard Brim of my staff at 517-625-4636 or me at the number indicated below.

Sincerely,



Seth Phillips  
Shiawassee District Supervisor  
Waste Management Division  
517-625-4632

cc: Bob Carlyon  
Tim Benton, DEQ  
Rich Brim, DEQ  
Duane Roskoskey, DEQ





JENNIFER M. GRANHOLM  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



STEVEN E. CHESTER  
DIRECTOR

September 8, 2003

Mr. G. Robert Carlyon  
Water Plant and Facilities  
4500 N. Dort Highway  
Flint, Michigan 48505

Dear Mr. Carlyon:

SUBJECT: Subsurface Evaluation and Remedial Options Report for the City of Flint,  
Bray Road site

Staff of the Waste and Hazardous Materials Division of the Department of Environmental Quality (DEQ), Lansing District Office, have reviewed the Subsurface Evaluation and Remedial Options Report dated June 2, 2003, and received on June 9, 2003.

As a result of this review it has been determined that additional sampling must be performed to determine the extent of contamination at the subject site. The City of Flint should consider re-sampling those wells that show excessively high levels of contaminants.

The City of Flint needs to move forward in determining what remedies must be taken to properly close the landfill in accordance with Part 115 regulations or alternatively the removal of all solid waste from the Bray Road site.

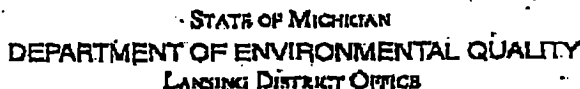
We would be happy to meet with you in regard to any questions or concerns you may have in regard to moving forward with determining the extent of groundwater contamination and the remediation of the Bray Road site.

If you have any questions, please contact me at the number indicated below.

Sincerely,

Richard Brim  
Environmental Quality Analyst  
Shiawassee District Office  
Waste Management Division  
517-335-6200

cc: Tim Benton, DEQ



# DEQ

**STEVEN E. CHESTER**  
DIRECTOR

|                  |                |         |            |              |   |
|------------------|----------------|---------|------------|--------------|---|
| Post-It Fax Note | 7871           | Date    | 11/2/03    | 1 of 1 pages | 2 |
| To               | Tom Hardy side | From    | Bob Carlyn |              |   |
| CC/Dpt           | GZA            | Co,     |            |              |   |
| Phone #          |                | Phone # |            |              |   |
| Fax #            | 734-462-6508   | Fax #   |            |              |   |

Dear Mr. Carlyon:

**SUBJECT:** Additional Sampling Services Work Scope for the City of Flint, Bray Road Site.

Staff of the Waste and Hazardous Materials Division of the Department of Environmental Quality (DEQ), Lansing District Office, have reviewed the Additional Sampling Services Work Scope dated September 25, 2003, and received on September 29, 2003.

Staff of the DEQ have reviewed the Additional Sampling Services Work Scope, and it is approved with the following conditions:

The City of Flint must re-sample Monitoring Well Number 3 and sample the residential drinking water wells, which are located at the houses immediately east and down gradient of the site. All of these wells must be sampled for chloroform, as well as other constituents that exceeded Residential Drinking Water Criteria, as identified in the Subsurface Evaluation and Remedial Options Report dated, June 2, 2003.

The letter dated September 25, 2003, from GZA GeoEnvironmental, Inc. (GZA) sent to the City of Flint and the DEQ, indicated that GZA is prepared to begin field work to collect samples for analysis within five days of receiving authorization from the City of Flint. Within 30 days of the date of this letter, the City of Flint should indicate in writing, when the additional sampling is to begin.

The City of Flint needs to continue to move forward in determining what remedies must be taken to properly close the landfill in accordance with Part 115 regulations or alternatively the removal of all solid waste from the Bray Road site.

We would be happy to meet with you in regard to any questions or concerns you may have in regard to moving forward with determining the extent of groundwater contamination and the remediation of the Bray Road site.

Oct. 28, 2003

Sincerely,

Richard Brin

cc: Tim Benton, DEQ.

RTB/jlr



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT  
LANSING



January 18, 2011

Mr. Gregory Eagon  
City Administrator, City of Flint  
1101 South Saginaw Street  
Flint, Michigan 48502

Dear Mr. Eagon:

Subject: Bray Road Water Treatment Residuals Storage Area

On November 23, 2010, the Department of Natural Resources and Environment (DNRE), Environmental Resource Management Division (ERMD), met with a number of representatives of the City of Flint, including Mr. Steve Montle, Flint Green City Coordinator, and Mr. Michael Brown, City of Flint Utility Administrator. At this meeting, the City of Flint representatives were looking for input from DNRE staff regarding the possibility of utilizing a property along Bray Road for temporary disposal of lime sludge generated at the Flint Water Treatment Plant.

Staff of the ERMD was familiar with the property in question, as the property was previously used for illegal disposal of lime sludge and other solid waste, and in the past had been the subject of a number of letters regarding solid waste disposal compliance issues. A file review of the property known as the Bray Road Site revealed that several documented compliance issues remain unresolved. The unresolved compliance issues include; illegal disposal of waste, incomplete investigation regarding groundwater contamination, and lack of a plan for proper closure of the site.


Correspondence in the file indicates that the City of Flint was issued two Letters of Warning (LOW) regarding illegal disposal. The first LOW was dated April 9, 2001, and cited illegal disposal activities. The second LOW, dated February 14, 2002, cited continued illegal disposal at the Bray Road Site. In a letter dated March 1, 2002, Mr. Darnell Earley, City Administrator at that time, responded to the LOWs. In that correspondence, he indicated that the improperly disposed items would be removed and disposed of at a proper landfill. Several letters were subsequently sent in early 2002 regarding the Bray Road Site. Specifically, in a letter dated March 22, 2002, staff of the Waste Management Division (now ERMD) indicated to the City of Flint that all solid waste at the site must either be removed or the property must be properly closed as a landfill in accordance with State requirements. In a letter dated March 26, 2002, the City of Flint expressed concerns regarding difficulties in estimating costs for waste removal and/or in-place closure. And, in a letter dated April 19, 2002, ERMD staff provided information regarding expected necessary site work including the need for soil borings and monitoring wells.

This need to gather field data resulted in the City of Flint completing an initial soil and groundwater evaluation at the site in February 2003. This work is summarized in a report titled Subsurface Evaluation and Remedial Report (June 2, 2003) and was conditionally approved by ERMD. The City of Flint provided another report titled Additional Sampling Services Summary for the Bray Road Water Treatment Residuals Storage area dated July 28, 2004. In this summary, the City of Flint made recommendations regarding additional sampling. The ERMD file is unclear as to whether the recommended re-sampling, outlined in the Additional Sampling Services Summary report, was ever completed. At this time, the ERMD requests that the City of Flint submit the re-sampling results in the form of a summary report to ERMD. In addition, the City of Flint should provide a work plan and schedule of proposed work that will bring the City of Flint into compliance with Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This work plan should address the solid waste issues as well as the groundwater contamination identified in previous reports.

The items of concern discussed in this letter must be addressed whether or not the City of Flint continues to pursue the proposed property use as described above. The ERMD understands that the re-use of the Bray Road sludge lagoon may play an important role in the operation of the Flint Water Treatment Plant (WTP) as a properly engineered and constructed lagoon could provide a viable option for the temporary storage of lime sludge from the WTP's softening process. However, before the ERMD will consider re-use of the Bray Road facility for temporary disposal of lime sludge from the Flint WTP, ERMD would require that the City of Flint enter into a binding legal agreement with the DNRE to memorialize the City of Flint's commitment to perform the environmental work and closure activities required at this site.

If you should have any questions in regards to this correspondence, please contact me at the telephone number below; via e-mail at [arduinj@michigan.gov](mailto:arduinj@michigan.gov); or Department of Natural Resources and Environment, P.O. Box 30242, Lansing, Michigan 48909.

Sincerely,

  
James Arduin, Senior Geologist  
Environmental Resource Management Division  
Lansing District Office  
(517) 335-6172

ja/jlr

cc: Mr. William Yocum, Acting Lansing District Supervisor ERMD  
Mr. Richard Brim, ERMD  
Mr. Steve Blayer, ERMD  
Mr. Mike Prysby, ERMD  
Mr. Steve Montle, City of Flint  
Mr. Michael Brown, City of Flint

Did Elrod DPW get FOIA?

- Brown @ WTP

✓ - Ozone

✓ - Data Tuesday #1-2 weeks

- Monitor - try → via DCH

✓ - Cl min Residual  $\approx 0.5$  ppm gal

✓ - Flushing

✓ pH 7.2-7.8  
→

- Harvard

- Bunt

- Daugherty

- Mike Gloscoe

- Jerry

- Natasha

-

- Mike P

In groups

- Patient Interviews

- Hospital initial cases



2 in June

0 in Feb at this time

50% on and 50% off

↑ but possible

- 8000-18,000 hospitalized  
3000 Reported cases
- Can't get Legionnaires from Drinking Water  
water based aerosols
- Home owners

Naturally found in warm water

temp  $> 158^{\circ}\text{F}$

disinfectant level 2-4 ppm in pools

pH level (7.2-7.8) (for HOCL)

- ideal growth  $95^{\circ}\text{F} - 115^{\circ}\text{F}$
- Legionella growth  $68^{\circ} - 122^{\circ}\text{F}$   
below  $68^{\circ}$  dormant

- Hot tubs

- Cooling Towers

- Large Plumbing Systems

- Hot Water Tanks

- Decorative Fountains

✓ 0.5-2.0 ppm continuous

• ozonation used

RO or ultra filtration

Building domestic hot water

Flush now before  
temp in WM reaches  
 $68^{\circ}\text{F}$

Special Pathogens Lab  
Pittsburgh



→ Too related to Cl reduction  
color

- No Std. for Taste or Odor  
as they are based on an individual's preference

NSF Std. 42 → bacteriostasis, taste, odor, other aesthetic  
NSF Std. 53 → Health Effects

tested based on Hardness 170 mg/L or less

pressure drops of up to 15 psi initially

- Heterotrophic Bacteria Not Plate Count
- Chloride
- Sulfate
- TDS
- T+D (Chlorine removal w Act. Carbon)
- Hydro Sulfide
- Iron
- Manganese
- Zinc

Most Not  
- particulates

Service  
cycle ~ 3 months  
100 gallons

- WM Replacement Project Highlight
- Fixing KRRR Article
- 500 miles replace 100 yrs.

$$S \text{ miles/yr} = 5 \times 5280 = 26,400 \text{ ft/yr}$$

$$26,400 \text{ ft} \times \$150/\text{ft} = \$3.96 \text{ M/yr}$$

if evenly distributed + may not cover <sup>all</sup> road work

vs. actual

but Flint > 50% already over 75 years so  
replace  $\frac{1}{2} \approx 250$  miles in next 25 yrs or 10 miles/yr

so double cost  $\$4 \text{ M} \times 2 = \$8 \text{ M/yr}$  for  
next 25 yr + inflation

# Flint Water Plant - Project Plan

[illegible]









## Flint Info / Questions

- ✓ ① November MOR received <sup>12/10</sup> Mike/Adam complete
- ✓ CI Residual ~~ph~~ pH + PO<sub>4</sub> ok w/ set pts.
- ✓ ② LSL Info 12/10 rec'd incomplete  
potential actions  
710 d (a)(1)(A) = (D)  
↳ Sec 7  
↳ Sec 22  
- criminal investigation uttering + publishing / fraud <sup>falsification</sup>

### ③ EPA FTF 15-5

- Water Quality Goals → (AWWA Doc?)
- Plant Performance
- Potential Issues? Test Runs help
- Staffing Protocol → Operational Schedule of Personnel
- Parallel Line Construction than Req'd
- Bench scale jar tests → oper parameters
- Pipe Rigs  
↳ EPA status

### ④ School Status

- |                      |               |                 |      |
|----------------------|---------------|-----------------|------|
| - Doyle Rd = OEA w/R | - Holmes STEM | - DTM           | - SW |
| - Pierce = OEA       | - Potter      | - Central Kitch | - NW |
|                      |               | - Northeast     |      |

⑤ 1/2016 - 6/2016 Pb/Cu sampling

- Sampling Pool of Tier I sites info & addresses
- 180 sites?
- 60 samples req'd
- Reporting Form
- Customer Requested Sample → Tier I confirmation + inclusion

④A

### Future School Testing

- Daycare Centers ≈ 200 licensed
  - OEA reports
- Intern use as part of sampling team
- 8 DLARA Plumbing Inspector Personnel
- min 4 teams
- ~~MAD~~ Staff Available?

## Flint Drinking Water Task Force (FTF 15-5)

### Task Force Recommendations Regarding Flint Drinking Water Treatment Performance Evaluation

For protection of public health, Flint must avoid significant distribution system issues similar to those experienced following the source water switch to the Flint River and subsequent operation of Flint's water treatment plant.

The EPA Flint Safe Drinking Water Task Force recommends that Flint develop and implement a Performance Assessment Plan prior to distribution of water from the Karegnondi Water Authority (KWA) source. The plan must address how the treatment plant will be brought on-line, and how finished drinking water will be introduced to the distribution system. This plan is particularly important given the City has no experience treating the KWA-supplied water, and is operating a distribution system that is still recovering from the past upset.

Flint should work with its consultant and MDEQ to establish objective water quality and plant performance criteria. The plan must include operation of Flint's drinking water treatment plant for a reasonable period of time to treat KWA-supplied water until:

- (1) the treated water meets finished water quality goals;
- (2) the finished water quality is consistently maintained;
- (3) potential plant operational and mechanical start-up issues are identified and addressed; and
- (4) water plant operations staff are proficient in treating the new source.

KWA water should not be distributed to the public until these conditions are satisfied.

During this performance evaluation period, Flint must distribute to the public water from an alternate source. As water is already received from Detroit (Great Lakes Water Authority), that is an obvious and appropriate choice for that interim period. The length of the performance evaluation period will be dependent on the amount of time it takes for the treatment plant to consistently and reliably meet the performance criteria.

Because of similarities in source water and in treatment processes with Detroit's Huron plant, the Flint water plant will likely be configured to produce treated water with similar quality to that of the water currently being received from Detroit. Continued use of Detroit water during the performance evaluation period will minimize the risk of distribution system upsets.

We encourage Flint and the City's consultant to perform a number of assessments prior to the completion of the KWA pipeline and availability of the Lake Huron source water to expedite the plant transition period. For example, the planned bench-scale jar tests will be helpful in establishing full-scale treatment plant operating parameters. Assessment of corrosion control treatment using Detroit source water with lead pipe loop rigs in advance of switching to the KWA source may also be transferrable to the KWA source water. Pipe loops rigs operated during the performance assessment period will help predict whether lead release will be an issue when the new plant goes on line. EPA will work with the City to set up pipe loops at the Flint treatment plant.



Benzie, Richard (DEQ)

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Monday, January 26, 2015 10:28 AM  
**To:** Benzie, Richard (DEQ); Shekter Smith, Liane (DEQ)  
**Cc:** Prysby, Mike (DEQ)  
**Subject:** Flint Hospital Meeting

The meeting with the Flint hospitals is this Wednesday 1/28 at 3:00 at the Hurley Medical Center. DCH will be calling into the meeting. Given that there may be "secondary treatment" issues with these facilities attending in person seems more appropriate.

Please let me know if one or both of you can attend. Thanks.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

Call In @ 3:30

7-21-2015

- Dennis Muchmore →

- John Walsh

- Bill McBride

- Harvey

- Dan Wyatt

- Stan Busch

- Eric Brown

Flint Water Issue

Talked - Brad + others

State Responsibility

- Flint city 7-1 decision  
GC comm. decision

- Make this work for Flint  
withdrew DWED → River  
perceived quality conditions

- Brown water

- disputed issues

- lead current issues

- federal protocol

- DEQ analysis not collection

Minority Coalition legitimate concern

- DEQ + DHS

lead in general exposure

Harley Hospital Tests?

↳ contact

told Brad

talked to Dan/Mike/Brad

More Aggressive Approach

DW → Public Health Issue

KWA + DWSD decisions made by  
- City Council

Ed Kurtz walking

Barclay Question

Physically

- 1500 Filters? by Meyer

- Go Fund Me

Barclay

Meyer + Harv. Dept

Harley Purchasing Filters

Jerrilyn DHHS  
- 3:00

- Hurley Press Conf.
- Data being reviewed 2 partial yrs.

AHS 5 year period of time  
more points of data sample pool

LAD - ~~PH~~ ~~PH~~

- following Hurley press conf.
- Health Officer can handle

want GCHD on ground not OAHIS if possible

Leave w/ Brad + Jerrilyn

# Getting Directors out

- Safety of citizens is first priority

AAR Mtg

4:00  
12-15-2015

- Call w/EPA last week
- Mtg<sup>let</sup> on Friday @ C
- Call Today

- KWA to WTP bundle

- 3 Mile Temp Line Not until July \$4 Million
- Interconnect w/ GDC Pump \$7-\$8 Million
- Old Interconnect

Pipe Loop \$ → EPA but no funding

DW Terminology Sheet - Liane  
Funding Breakdown

Jan 7 AWWA Workshops

NRDC FOIA → getting





12/9/2015

AAR Mtg

Potter Elementary Lab Results

Friday 10:00 Mtg





12/8/2015

Contract Mtg

Potential Resumes



AAR Mtg

12/8/2015

① 201 LAN → Phosphate Classification

School Data → Brownell Tomorrow on web  
↳ Review

②

Admin + Ele/Spec

18<sup>th</sup> → HS 28/29/30

③

D/H/S

④

2016 Mtg Schedule

⑤

Gov Talking Pts.

⑥

At EPA

⑦

Mayja has language

Federal legis  
State Legis

⑧

⑨

MtH LSL ID after next Mayja Mtg

⑩

Lead Ed.



⑪ KWA mtg. w/ Flint + DEQ

⑫ ~~EPA on phone or in person still unknown~~  
Pseudo Mtg. cancelled

⑬ Joan Rose  
not avail.

⑭ Outreach  
GCND 17th criteria

⑮ School Outreach  
↳ State Superintendent



AAR Mtg (Called-In) 12/4/2015

- Dan
- George
- Karen

- Mayor Mtg

- 3 Pastors on Transition Team

- Cost Payments

- Progress → Schools  
LBL Data

DHHS Data Released Yesterday  
2010 Highline  
3rd Qtr 2014 City + County Spks  
2015 down  
Oct - Today

- DWRP Submittal Requirements

- Have RS + CIP

- Loan Forgiveness Training

(Needs Survey)

LSL ≈ \$60

\$4.2M/yr

Asked City for RS, AMP, NS, & CIP

George Mtg today

RLF Documents

- higher collection rate?

- PD4 Wed. Next week



Superintendent

- Has all of data through Neitherscut

- HS during winter breaks

- Andy Yes



28/29 SW

- Cole



29/30 NW





# School Report Mtg.

12/2/2015

12/4

12/11 EPA Mtg. 10:00  
Assessment?

12/21 HS

12/28 HS



AAR Mtg

12/2

- Operational Mid-Week of 12/7
- 12/9 group mtg. + EPA presentation
- Phelps → check w/ Stephanie K.
- FOIA
- Gov Reg.
- LAU email (suit?) check w/ AG office
- school rpts
- EPA Mtg 12/11
- comments on EPA Proposal

Director Mtg w/ Mayor 12/3 10100

Mayor has 100 day plan (unknown content)

12/3 Interview Alvarado

Question Rept?





# EPA Call

12/1/2015

## - Pipe Loop Recommendations

### Preliminary Assessment

- Optimal Dosage
- transition to RWA at WTP

by Dec 10?

- Current Inventory of homes w/✓
- 

## - WQP insufficient?

- ✱ - Develop Method for LSL detection

Field Test vs Lab Analysis  
Martinez





Internal AAR Mtg.

11/24/2015

## Bottom Plan Update

- ① ✓ added items  
OAG → FAQ + Timeline
- ② Fishman Report → Superintendent → post Kaplan  
→ Brownell → others
- ③ HHS Data? Status Unknown
- ④ Mtg. scheduled 12/3
- ⑤ Update on solutions
- ⑥ 12/3 Mtg. following Mayors Mtg.  
↳ get info from EPA Dennis Lytle

⑦ DAKS

⑧ Check on Mtg. date regarding progress KWA

⑨ TAC after Dec

John Rose 11/30 @ 9:45

Ed. Dept.

State Garden to Schools





DEQ AAR Mtg.

11-17-2015

- EPA ask for KWA like study
- State CWS Protocol Revisions
- Leak Monitoring Report

# DEQ's 17 Point Partnering Plan

~~11/17/15~~  
11/17/2015  
KOD

- ✓ 1. After Action Plan (FAQ) will be ready by noon November 16, 2015  
*Done*
  - First version complete – updated as needed
2. School Test Data
  - School reports to be expedited
  - Steve Busch creates summary reports
  - George Krisztian creates summary spreadsheet
3. Blood exposure
  - DHHS is lead on providing data *- Investigations start 11/19*  
*- Callus/Mark (Dora)* *- Protocol (w/under) revised/recounted*
4. Meeting with Mayor Karen Weaver
  - Harvey Hollins lead – Dan Wyant, Jim Sygo and George Krisztian to attend
5. Messaging our Partnering Plan
  - Provide ongoing public updates regarding Governor's 10 point plan
  - Continue emphasis on the availability of free testing for Flint residents  
*- OEA call instructions protocols*
6. Sampling Protocol *- Liana*
  - Establish alignment with EPA Region 5 on sampling protocol *(LCR)*
7. Lead service line replacement
  - Expand RLF directed at lead service line replacement *→*
  - Amy Epkey, Maggie Pallone and Sonya Butler  
*My tomorrow*
8. Partner with EPA
  - *Ryan V. Scudone*  
• Jim Sygo → Bob Kaplan  
• Dan Wyant → Susan Hedman  
• Mike Prysby and Steve Busch → Daren Lytle and Mike Schock  
• George Krisztian → Tom Burke
9. Meet with Mott Foundation to discuss Lead Service Line Identification Study  
*→ include Daren + Mike*
10. Lead Education Program *+ LNDs*
  - DHHS is the lead on Lead Education Program  
*Medical + Public*

11. Moving KWA forward

90-120 days to get done?

- Proactive meetings with KWA

12. Participate actively with Technical Advisory Council

↳ Who's in charge? - New DPA Director

13. Utilize Joan Rose and MSU water expertise

→ Annals work distribution

others?

14. Public Outreach

- Mayor Karen Weaver
- Genesee County Health Department
- Drs. Lawrence Reynolds, Eden Wells and Matthew Davis
- Ministers
- Land Bank
- Legislators
- Citizens

15. Outreach to schools

- EPA guidance on testing
- Work with state superintendent

16. Make recommendations to EPA about LCR

17. Compliance Communication letter sent November 9, 2015

- Wait until after Dec 30<sup>th</sup> / Response

Essential  
13. Health Information Confidentiality  
Not Patient





DEQ AAR Mtg

11/16/2015

FAQ

- GM

- DEQ Appendix

> insert by COS today

- EPA last program audit as FAQ Attachment?  
Add'l Background Info

Dir. Action List

19 issues/questions list





Supply Protocols

11-15-2015

FAO

Sched Data

-EBLL

Mayan

Mar E

-LSL

-EPA Partnership

-LSL IDing

-Lead/Eln

-CCT for KWA

---

- AAR Dec 12:00 Monday

- Sched Test Reports George

- 3 EBL exposure testing (Dan)

- 4 Mayan Mty (Gov Office)  
Daguerre, George

- SM Eln ~~testing~~

- 6 Sampling

A - LCR

B - EBL Exposure

C - Sched

D - Daguerre



- DWRF LSL

Amy, Maggie, Sonja

- Mott, Natasha

ID-the bus

- Letter

- Sample Control  
+ School Info

---

20 LCR Recruiters  
Schedule Mtgs



11/12/2015

DEQ AAR Mtg.

- Background Update  
tonight commits on new draft A/C
- 10 pt Plan Update by Karen T.
- ~~ECCT~~ → Installation w/ city
- San P.O.D. Issues





DEQ-AAR Mtg

11-10-2015

- ① ~~DEQ~~ AAR Task Force Gov.
  - ② - EPA Task Force in Flint w/ Full Review
  - ③ - Ongoing school testing
  - ④ - Legislation + Congressional Response
  - ⑤ - Internal
  - ⑥ - DHS Info
  - ⑦ - Proactive Comm.
    - ↳ Messaging
  - ⑧ - Update on TAC Jim + Mike L. George called about L&R compliance + Lead Exposure w/ 30 Engine works research Natasha + New Mayor would be next of steps
- ② EPA wants to do research project  
≈ 10 EPA staff in Task Force
- Dr. Edin Wells talked about blood samples - but no data
- George spoke w/ Linda Data + IT Issues?
  - Dir. to contact mayor (George has mtg. on Fri)

Gov. AAR Mtg. tomorrow  
no staff but  
11/18 Mtg w/ staff

- have timeline + attachments
- background AG review + revisions needed (by Cog Fis?)  
draft
- ask Eric Summary of DER opinion  
- DER actions



Sampling Mtg 11-6-2015

## Next week

- Marilyn Freeman Data
- Cushman Requested Data
- Jim - Task Force Mtg.  
+ George?
- Mike + George
- TAC Agenda





AAR Mtg

11/5/2015

- Timeline Review by today?

EPA - ① Feb

② May/June

Rule is ambiguous  
50,000+

③ Test & # of samples

④ Disruption Issue

⑤ New Guidance from EPA  
DEQ Policy?

- Refinement of Messaging & going forward  
- May vs. Oct

~~WTP~~

NPR / Jim Interview

- Sample Disputed

- Cont by City on Tier 1

- LCR not reflective of exposure  
WTP + Disruption questions

- Ed. Info City → Residents



# Residential Drinking Water Sampling Protocol

## Agenda

November 5, 2015

1. Introductions
2. Overview of EBL investigations and case management (HHS)
3. Overview of water sampling protocols (DEQ)
4. Discussion
5. Logistics
  - a. Sampling supplies
  - b. Handling and packing for transport to the lab
  - c. Results reporting

#### Flow/coordination of EBL cases

- ✓ MDHHS (Bob Scott) will send an updated list of EBL children in Flint weekly
- ✓ GCHD (Sherry) will review list and assign EBL cases to CM ← *Case manager*
- ✓ Sherry will send contact information via email to MDHHS-Courtney
- ✓ MDHHS-Courtney will review and send to ETC (EBL Environmental Investigator (EI) Contractor) and an EI will be assigned to the case.
- ✓ GCHD CM will contact family to determine available scheduling dates/times.
  - CM will discuss how the family must prepare for the site visit, including the water
    - sampling prep using following three step process to collect water samples:
      - ✓ a. Scheduler will attempt to ensure water is not used for at least six hours prior to Contractor arrival in order to collect first draw water samples. The Contractor will send the family instructions on water use prior to the visit.
      - ✓ b. If this step is unachievable, Contractor will ask family not to use the water during the site visit and will stay at the unit for a minimum of six hours and collect the first draw water sample at that time.
      - ✓ c. If this step is unachievable, Contractor will schedule a return visit for early morning time to collect the first draw water samples.
- ✓ GCHD CM will contact John DeFabio at ETC 800-864-3236 and coordinate schedules to attend the initial site visit together.
  - **On-site:**
    - ✓ ○ The EI will draw water samples first thing to allow for family to use water thereafter.
    - The EI will conduct the Occupant Questionnaire
    - The EI will begin investigation, while
    - The CM provides case-management services to the family, including the presentation of the lead dust cleaning kit and associated education. If a HEPA vac is available through the EI, the CM will teach the family how to use the vac safely. Hopefully, this can be done while the EI is conducting the investigation and the vac can be taken back with them to alleviate pick up.
    - When the CM has completed the visit, she will leave the site. The EI will continue the investigation until complete. The CM will explain the procedure to the family prior to the first visit.
    - The EI will screen the family for eligibility into the MDHHS-Lead Safe Home Program (LSHP) for abatement of lead-based paint hazards (I have attached our LSHP application packet with eligibility requirements listed on the flier).
      1. If the family appears eligible for the LSHP, the application will be submitted to Courtney for processing.
      2. If the family is enrolled in the LSHP, Courtney will notify Sherry/CM via email.
      3. For the families that do not qualify for the LSHP, referral to other resources will be provided, if available.
    - The EBL Environmental Investigation is not reimbursed by Medicaid, therefore, MDHHS or ETC will not bill Medicaid for any services.

- GCHD requested that ETC provide the CM with a summary letter of the EI findings. Courtney confirming with ETC that this is possible.
- The CM is expected to perform at least two case-management visits and will continue to visit (home and phone) the family until the EBL child has two blood tests below 5 ug/dL.
- There are current testing events set-up with GCHD as follows:
  1. November 5 at GCHD-Burton Location from 8-12 noon and 1-4 pm.
  2. November 12 at Brownell School from 3-6 pm.
  3. ETC can be available to answer questions regarding investigations at some testing events.
- If an LSHP application is received at MDHHS for Flint and has an EBL child, Courtney will contact Sherry to see if any services have been provided by GCHD. If yes, MDHHS will order and EI. If no, ETC and the CM will coordinate schedules as discussed above.
- MDHHS CLPPP is providing training to the GCHD CM's on November 10, 2015. ETC and MDHHS staff will attend for a meet and greet of staff.



DHHS Mtg.

11/5/2015

Funding for Staff

- Nursing Staff @ GCHD
- Contract for Env. Sampling  
including water sampling

Investigation Cont. Parties

Soil / Dust / Paint

Cosmetics / Dishes / other consumer goods

5 staff @ DHHS

ETC is certified contractor

signed contract

4-5 staff

GCHD Nursing Health Care Case Mgmt

try to do health ed & Env. Invest. at same time  
ETC to collect water samples

see draft flow chart

Investigation ~ 6 hr

- Historic City LCR sampling
- Home Plumbing Info → materials & leaks, grounding
- Service Line Information
- Multi Family Resident Housing

$$75' \ 3/4" \quad \left(\frac{0.75}{12}\right)^2 \times 0.785 \times 75 \times 7.48 = 1.72 \text{ gal}$$

$$60' \ 1/2" \text{ Plumbing} \quad \left(\frac{0.5}{12}\right)^2 \times 0.785 \times 60 \times 7.48 = \underline{0.62 \text{ gal}}$$

10 L = 2.65 gallons

2.34

$$2.65 - 2.34 = 0.31 / 7.48 / 0.785 / 0.004$$

13.2 ft

DHHS → Email Historic

HPPA key for Lab Analysis

Coordinated Message on Results

- DHHS Exposure
- LCR - 15 ppb

Purpose of monitoring is to identify source  
& reduce exposure





## EPA Task Force Call

11/3/2015  
4:00

- MDEQ Construction Permit - No Amendments
- MDEQ C&T operation letter

Sampling that would include more than Pb/Cu  
for diagnostic other metals

ok @ EPA lab but not used  
for compliance

Mtg w/ Kildee

10/21 letter from Kildee to EPA

1st session 2/2015 - 10/2015 timeline

2nd w/ Task Force

(Future Public Document)

- Task Force Mtg. in Rep. Kildee's ~~office~~ office

- Sampling Events @ schools

- DHAS release data at same time

data entry issues done by this week?

- Customary Sampler

- 3 Elementary Schools sequential 12th & 1/L

- Diagnostic Monitoring

-

-

- TAC Monitoring



Flint Update Mtg.

Don Conf. Rm  
9:40 AM

11/2/2015

① - Forger + Mich Ralis → Sampling Protocol

→ Walters  
→ LCR sites + DEQ confirmation  
→ 100 → 60

Request to city to clarify LCR designation

DEQ communicated the requirements

George or Jim?

Big Picture

Packman Test Results

Freeborn 31 sites done

→ 3 sites 10-11

Essexham

Brownell

① Sygo-MPR

30 min

② LSL Tier 1 verify

15 min

③ Email to city on timelines <sup>POA</sup> status

④ LCR changes <sup>Elmwood?</sup>

- Action Steps 1/4K

- Daycare

⑤ Test Results

- Home samples / DPHS



## Action Steps

- Contact DHAHS on status of Lead Bl Materials

- Call to city

- Email from LDO

timeline + status for install

Tues. PM

Mon 1/15 - Chlorine Residual Data → Email to Hand on  
from TCR sites

- MOR on standby operation  
↳ letter

- DHAHS to get LSL spreadsheet

- Draft Residual monitoring to HHS



10:30  
10-27-2015

- General Lead Education Outreach Status
  - Childhood Pb Prev. Program
  - Letter through schools + daycare (Flint specific)

DHHS Draft Communication Plan

EBL Investigation

Lead-based Paint Act

- where poisoning in child occurs
- abatement

- EBL <sup>Investigator</sup> meeting + water sampling







Following Sampling Mtg

11:00  
10/26/2015

- Sample Observations

Suggestion 5th Sample?

~ 10 sec for 125 mL?

Use 1-2 sites? for Liter samples

Ideal groups 2-3

2 teams or 3 for each school w/ 1 coordinator

(5) (7)

Data Evaluation

16L bottles 1-4 for each site

Tony

Lo. Eschling

Lo.

Joe

Kelly

3-17



9:30  
10/30/2015

## Mtg. w/ DLARA

Joe has layouts for 3 schools  
rooms only

- Current Draft - GCHD taking samples (not currently use)  
of protocol
- DLARA check w/ architect on plumbing plans
- All maintenance is contract
  - school plumber

Freeman is 1st

Hope to get all 3 schools done  
2-3 hours each

## Naming + Labeling + Sequencing Plan

Take picture of each

- Label, Tape, Perm. Marker
- Ladders Available
- Lead Solder Kits to test
  - Haver
- 3 categories of fountains

Timing for schools?





# **City of Flint Water Action Steps for Week of October 19-23**

| Step No. | Action Step                                                                            | Involved Parties       | DEQ Point(s)<br>of Contact                            | Status                                                                   |
|----------|----------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|
| 1.       | Update 2004 letter to EPA                                                              | DEQ                    | Dana DeBruyn                                          | <i>To be done following AAR completed</i>                                |
| 2.       | Schedule Flint Water Treatment Plant tour                                              | DEQ and Flint          | George Krisztian                                      | To be scheduled for week of 10/19/15; waiting on confirmation from Flint |
| 3.       | Figure out number of samples from schools and child care facilities                    | DEQ                    | Jim Sygo<br>Pat Cook<br>Steve Busch                   |                                                                          |
| 4.       | Conduct After Action Plan                                                              | DEQ                    | George Krisztian                                      | Initial meeting to be scheduled for week of 10/19/15                     |
| 5.       | Introduce legislative changes to Part 54 of NREPA – Drinking Water Revolving Loan Fund | DEQ, Treasury, and EPA | Maggie Pallone<br>George Krisztian<br>Sonya Butler    |                                                                          |
| 6.       | After Action Review Panel                                                              | DEQ                    | Madhu Anderson<br>George Krisztian<br>Karen Tommasulo |                                                                          |
| 7.       | Staff hiring plan                                                                      | DEQ                    | Jim Sygo<br>Maggie Pallone<br>George Krisztian        |                                                                          |
| 8.       | \$1 million for DEQ Laboratory billing code                                            | DEQ                    | Maggie Pallone<br>George Krisztian                    |                                                                          |
| 9.       | Finalize fiscal year 2017 budget request                                               | DEQ                    | Maggie Pallone<br>George Krisztian                    |                                                                          |

| Step No. | Action Step                                                          | Involved Parties | DEQ Point(s) of Contact                            | Status      |
|----------|----------------------------------------------------------------------|------------------|----------------------------------------------------|-------------|
| 10.      | Develop letter to schools                                            | DEQ              | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |             |
| 11.      | Finalize sampling protocol                                           | DEQ              | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |             |
| 12.      | Confirm school sampling logistics<br><i>George</i>                   | DEQ              | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |             |
| 13.      | Meeting(s) with school staff/management<br><i>w/John D. Kavanagh</i> | DEQ              | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |             |
| 14.      | Complete Non-Transient<br>Non-Community Water Supply letter          | DEQ              | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |             |
| 15.      | Meet with DHHS and discuss all lead education material for schools   | DEQ and DHHS     | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby | <i>w/26</i> |
| 16.      | ODWMA staff observe a DLARA plumbing assessment                      | DEQ and DLARA    | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |             |

| Step No.       | Action Step                                                                                                                                        | Involved Parties                          | DEQ Point(s) of Contact                                           | Status |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------|--------|
| 17.            | Develop sample form and chain of custody document<br><i>Lab</i>                                                                                    | DEQ                                       | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby                |        |
| 18.            | Provide Director Wyant with revised Part 54 language<br><i>Sonye</i>                                                                               | DEQ                                       | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby                |        |
| 19.            | Review corrosion control treatment plan and get any EPA comments                                                                                   | DEQ and EPA                               | Jim Sygo<br>Steve Busch<br>Pat Cook<br><u>Mike Prysby</u>         |        |
| 20.            | Review construction permit application and issue construction permit for phosphate equipment<br><i>Mike</i>                                        | DEQ                                       | Jim Sygo<br>Steve Busch<br>Pat Cook<br><u>Mike Prysby</u>         |        |
| 21.            | Review Standby Operation of Flint Water Treatment Plant with city of Flint<br><i>→</i>                                                             | DEQ and Flint                             | Jim Sygo<br>Steve Busch<br>Pat Cook<br><u>Mike Prysby</u>         |        |
| 22.            | Provide city of Flint updated monitoring schedule based on Detroit Water and Sewerage Department (DWSD)/Great Lakes Water Authority (GLWA) service | DEQ and Flint                             | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby<br><i>Adam</i> |        |
| <del>23.</del> | <del>Contact city of Flint and Genesee County daily for DWSD connection status updates</del><br><i>23 is done 10/16</i>                            | <del>DEQ, Flint, and Genesee County</del> | <del>Jim Sygo<br/>Steve Busch<br/>Pat Cook<br/>Mike Prysby</del>  |        |

| Step No. | Action Step                                                                                          | Involved Parties | DEQ Point(s)<br>of Contact                         | Status |
|----------|------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------|--------|
| 24.      | Work with Karegnondi Water Authority (KWA) and other agencies to address bottleneck issues           | DEQ and KWA      | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |        |
| 25.      | Verify city of Flint distribution operations under DWSD/GLWA service                                 | DEQ              | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |        |
| 26.      | Contact city of Flint for Service Line Record status update and obtain a copy of the records to date | DEQ and Flint    | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |        |
| 27.      | Provide DHHS with any available cross-reference information                                          | DEQ and DHHS     | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |        |
| 28.      | Develop childcare facility guidance or review DHHS related materials                                 | DEQ and DHHS     | Jim Sygo<br>Steve Busch<br>Pat Cook<br>Mike Prysby |        |





- Mtg w/ AHS on lead education
- Create school sampling guidance  
for statewide distribution  
for school personnel to sample
- Confirm Assessments  
+ Sampling 2 schools → Bristol  
+ Framingham
- CCT letter back to City
- Weekly check on KWA

- Flint water
- Schools
- SRF

- BG/TL

## 26 Action Steps for Next Week 10/12-10/16

- Step 1. Identify schools and prioritize for assessment
- Step 2. Get DLARA plumbers organized →
- Pat Cook, 3. Complete sampling instructions
- David Dignan 4. MDARD info for restaurants
- David Dignan 5. Update 2004 letter to EPA 3 asks
- Mike Pysby 6. Approve Flint plan for water line DER Flint + GCR
- Liane 7. Lead education plan for schools for Drinking Water HHS Primary
- George 8. Begin regular meetings with Flint DER Flint
- George 9. Schedule WTP tour DER Flint
- Karen 10. Meet with schools and DLARA-invitation only ←
- Karen 11. Update Web page
- George 12. Contact DHHS to see where they are with United Way Emergency Declaration
- Liane 13. Circulate protocol draft with EPA DER EPA
- George 14. Contact City about homeowner sample delivery
- Liane 15. Communicate to MDARD and City that business samples should be coordinated through lab Envtl Hs Liane
- Pat Liane Steve 16. Figure out number of samples from schools and child care facilities est.
17. Confirm Lynda Dykema is POC for DHHS
- Pysby 18. Contact KWA to find out if there are any bottlenecks we need to remove
- Pysby let 19. Expedite 399 Plan and Phosphate Plan on Wed.
- Steve 20. Get update on service line index card conversion and identify where partial replacements exist DER Flint Steve 30% Done
- Steve 21. Make sure DHHS gets info so they can cross reference George
- Maggie 22. Legislative contacts
- Maggie 23. Legislative time line and summary
- Dan/MBT 24. Dan reconnect with state superintendent
- Dan/MBT 25. Conduct After Action Plan (George)
- (Maggie) 26. Change Part 54-Drinking Water Revolving Loan Fund Treasury + EPA

email - Info collection info to schools

- EPA email Atg summary to George





MDARD Call

11/15

10/8/1000-1:30  
200 Food Service

10 Proctors

- ✓ Restaurant
  - Operations
- ✓ - Filters
- ✓ - mapping of service line
- plumbing inspection

- facilities that serve  
primarily high risk populations

### how to get a test

GDC Draft  
Guidance Document



- MDARD
- DEQ

Kevin  
- 517-582-1156

email blast

MDARD

↳ Business  
Contact the  
Lab Directly





Call w/ Susan + Tom EPA

10/1/2015

10:30

- Tim Henry
- Tom Poy
- Carol? Brannan

- Cindy Smith
- Tom Smith
- Darren Lytle
- others?

### Activities

#### - Lead Samples

- Compliance Sampling
- Schools
- At Risk Households

} Refine

Tier Sites?

Tom Burke

Securing → First Draw

- ↳ Protocol for full plan
- ↳ School Planning

another approach

Chicago sampling protocol

↳ EPA + HUD sequential sampling  
10-12 Ltrs total

- Darren Lytle

Systematic to better define contamination



Subset  
- Exposure  
- Baseline  
Diagnostic Sampling Plan

- 2 Harley Zip Codes  
~~PH~~  
- NL +

ATSDR what is acceptable

15 ppb based on working corrosion control  
20 ppb for 3T?

Home sampling of Porot, sills, DWT

EOL of every child ~~stayed~~ but no funding

Down

FD - 45 sec - 2 min

- central regional lab

Director Buckley

(A)

Background Tomorrow

Flint Issue Summary Document

(1) Timeline

(2) TTHM

(3) Bacteria

(4) Lead + Corrosion

No safe level of lead

Treatment installation

Simple bullet points

DAAS  
Info

(B)

Diagram of Responsibilities (Flint specific)  
EPA → State → Local → Citizen

(C)

Letter to Kildee → tomorrow

EPA - meeting this

- protocol development

- committing resources

① Mott Mtg Wed, Infrastructure

Presentation Thurs FTE Funding  
for DAHS

② Mtg w/ Gov Office Friday 8:00-9:00  
- Treasury Call In  
- Office of Urban Development

③ Mtg on Monday 9:00 w/ legislators  
Tyra Hyde call Friday

TAC<sup>Mtg</sup> w/ Edwards

↳ Dir. Mtg

LBWL

First  $\pm$  \$60,000,000

WM 250 Miles

250,000,000

Directors

- 3 point

DEQ & DHS

- Editorial ~~board~~

- Auditing

- City PAC

- EPA Audit DFO

- Congressional Action

## **Wurfel, Brad (DEQ)**

---

**Subject:** Flint Water Conf Call

**Start:** Fri 9/18/2015 8:00 AM

**End:** Fri 9/18/2015 9:00 AM

**Recurrence:** (none)

**Meeting Status:** Accepted

**Organizer:** Clayton, Stacie (GOV)

**Required Attendees:** Hollins, Harvey (GOV); Muchmore, Dennis (GOV); Posthumus, Dick (GOV); Brown, Eric (GOV); Lyon, Nick (DCH); Wyant, Dan (DEQ); Khouri, Nick (TREASURY); Wisniewski, Wendy (GOV); Rospond, Laurie (GOV); Grijalva, Nancy (DCH); Thelen, Mary Beth (DEQ); Doyle, Maureen (Treasury); Pallone, Maggie (DEQ); Wurfel, Brad (DEQ);

**Optional Attendees:** McBride, Bill (GOV);

**Call In:** **PPI**

**Access:**  
Harvey will host

### **Agenda**

DEQ update on Flint water and elected officials briefing  
Dennis Muchmore update  
Harvey Hollins update  
Treasury update  
DHHS update  
Action steps going forward (DEQ)

### **Participants**

Dennis Muchmore

Dick Posthumus

Harvey Hollins

Eric Brown

Bill McBride

Nick Lyon

Dan Wyant

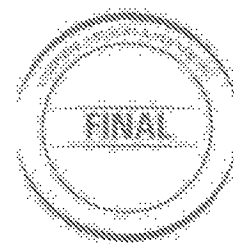
Nick Khouri

Liane

Wayne + Tom Treasury  
Wisham



# Operational Evaluation Report City of Flint



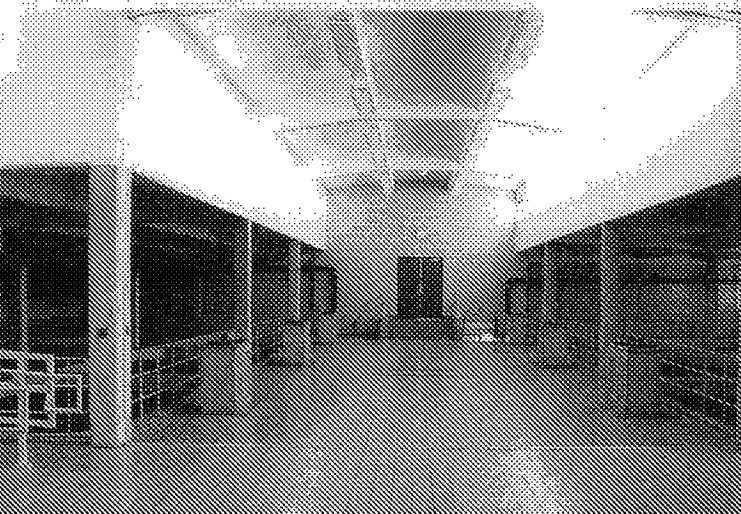
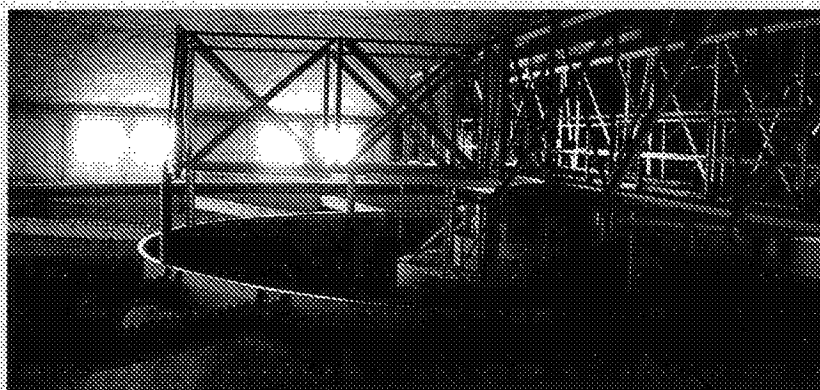
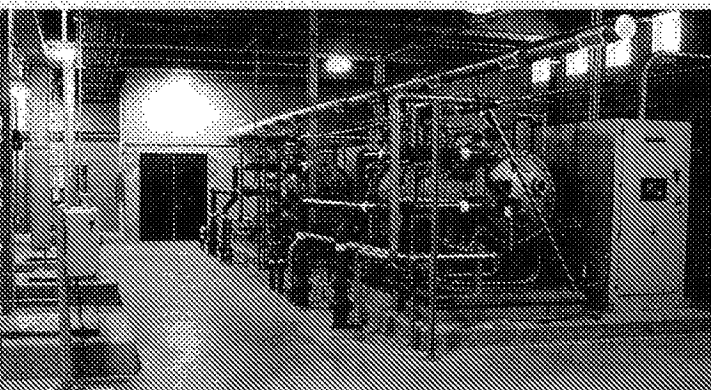
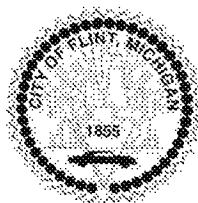
## Trihalomethane Formation Concern

DEO  
RESOURCE MANAGEMENT DIVISION

MAR 02, 2015

LANDING DISTRICT

February 27, 2015



Lockwood, Andrews  
& Newnam, Inc.  
A CECO A DAILY COMPANY



## EXECUTIVE SUMMARY

Environmental Protection Agency (EPA) and Michigan Department of Environmental Quality (MDEQ) regulations require that public water suppliers test drinking water quarterly throughout the distribution system for disinfectant by-products (DBP's). Two categories of DBP's, tri-halomethanes (THM) and halo-acetic acids (HAA5), are regulated and must be tested for. The City of Flint began operation of their water treatment plant (WTP) full time with the Flint River as the source on April 25, 2014. Since that time, four quarters of samples taken have resulted in an annual average violation for total THM. Prior to the first violation (Nov. 2014), the City hired Lockwood, Andrews & Newnam, Inc. (LAN) to complete this Operational Evaluation Report (OER) in conformance with EPA guidelines with the goal to determine the cause(s) of high levels of THM and evaluate possible solutions.

The EPA promulgated the Stage 2 Disinfectants and Disinfection By-Products Rule (DBPR) in January 2006 which set maximum contaminant levels (MCLs) for total trihalomethanes (TTHM) and HAA5 based on an annual running average, tested quarterly, for a given sampling location. The City of Flint reports levels from 8 sampling test locations. Of the four quarterly sampling cycles since Flint began operating the WTP full time, HAA5 levels have been acceptable but TTHM levels were high at 4 sampling sites following the third sampling cycle. Average THM levels exceeded the MCL at 3 sites following the fourth sampling cycle.







A number of issues have been identified as possibly contributing to the high THM levels measured.

1. Inefficient ozone system functionality which has resulted in increased chlorine feed.
2. Upstream source influences in terms of increased chlorine demand.
3. Bypass stream around softening contributed to chlorine demand and increased total organic carbon (TOC) levels in the effluent.
4. Unlined cast iron pipes in the distribution system contributing to chlorine demand.
5. High water age in the distribution system due to:
  - a. Broken valves causing less than ideal flow patterns.
  - b. Inefficient pump station pressure zones
  - c. Water storage volumes in excess of that needed for today's demands
  - d. Oversized water mains
  - e. Low water demands
6. High chlorine demand in filters. *From WTP?*
7. High THM formation potential (THMFP) in source water.
8. Less than optimal removal of THM precursors

A graphical representation of how the factors above relate to the timing of THM compliance sampling is shown as Table 1. Compliance sampling dates are hatched. Each row in Table 1 describes a factor that can lead to increased THM levels and the table defines when each of those factors applied. Note the convergence of nearly all factors around the second sampling period on August 21, 2014 to create what appears to be a worst case scenario. The table also shows that the factors listed as those that the City can control have been addressed prior to the February sampling period. Monthly operating report data up to February 1, 2015 is depicted on the Table.

TABLE 1 - SUMMARY OF NEGATIVE INFLUENCES ON THM COMPLIANCE SAMPLING

| FACTOR                                                     | 2014 |      |      |     |      |     |     |     | 2015 |     |
|------------------------------------------------------------|------|------|------|-----|------|-----|-----|-----|------|-----|
|                                                            | May  | June | July | Aug | Sept | Oct | Nov | Dec | Jan  | Feb |
| Softening bypass stream over 20% of plant flow             |      |      |      |     |      |     |     |     |      |     |
| Ozone system not feeding optimally                         |      |      |      |     |      |     |     |     |      |     |
| Using full water storage capacity of WSR & CSR             |      |      |      |     |      |     |     |     |      |     |
| Chlorine feed at WTP 7.0 mg/l or more                      |      |      |      |     |      |     |     |     |      |     |
| Ferric chloride feed rate less than 10 mg/l Fe3+           |      |      |      |     |      |     |     |     |      |     |
| Raw water temp 23 degrees C or more                        |      |      |      |     |      |     |     |     |      |     |
| Raw water TOC levels above 8.0 mg/l                        |      |      |      |     |      |     |     |     |      |     |
| Raw water coliform over 5000 counts/day                    |      |      |      |     |      |     |     |     |      |     |
| Positive bacteria test in dist. system (boil water notice) |      |      |      |     |      |     |     |     |      |     |
| Water demand less than 15 mgd                              |      |      |      |     |      |     |     |     |      |     |

-  Dates of occurrence
-  Dates of occurrence and expected to repeat in future years
-  Compliance sampling date
-  Factors under Flint staff control
-  Flint River characteristics
-  System factors







## **ACTION PLAN**

The City of Flint has signed an agreement with the Karegnondi Water Authority (KWA) to purchase raw water drawn from Lake Huron. The KWA system is currently under construction and expected to be operational by late 2016. The water supply from Lake Huron will have entirely different water quality characteristics from the Flint River and those characteristics are expected to yield drastically reduced DPB formation. With that, non-structural options to help reduce THM levels are much preferred over solutions requiring new construction. Therefore, two categories of actions have been devised: Stage 1 being actions that can be completed relatively quickly without major construction and Stage 2 consisting of either long term actions or solutions requiring major construction. The City is actively working to complete Stage 1 actions as soon as possible. Stage 2 actions are to be implemented only if Stage 1 actions are ineffective in adequately reducing TTHM levels and therefore Stage 2 is contingent upon the outcome of Stage 1. As of the date of this report, status updates for action items are shown in red.

### ***Stage 1 – Immediate Actions***

- Hire third party water quality expert to complete independent 'water audit'
  - The City hired Veolia Water to review all water quality related operations, procedures, actions taken and planned responses. Recommendations from Veolia are expected by the first week in March 2015.
- Obtain an in house THM analyzer to allow regular operational monitoring of THM levels
  - THM analyzer was installed 2/17/15.
- Hire ozone system manufacturer to troubleshoot ozone system
  - Manufacturer and controls programmers performed on-site evaluations in January 2015.
- Bench scale jar testing
  - Match existing process and assess possible areas of improvement
    - Existing process was simulated and an evaluation of existing chemical feed dosages has been completed by LAN.
    - Existing process TOC profile was developed by Veolia.
  - Simulate potential modifications to treatment process
    - Soda ash softening evaluation completed and PAC feed testing completed by LAN.
  - Evaluate coagulation and flocculation polymer aid feeds to assist with TOC removal
    - Evaluations of polymer aids completed by LAN and PVS Technologies.
- WTP operational changes
  - Discontinue softening bypass stream to reduce chlorine demand
    - Operational directive has been set to soften no less than 80% of flow.
  - Disinfection of filter beds to reduce chlorine demand
    - Utility Service Group contracted by City and condition assessment completed. Controls improvements have been completed.
  - Begin coagulation and flocculation polymer aid feeds to assist with TOC removal if bench scale test results are positive
    - Jar testing completed to date has not indicated a useful benefit to feeding coagulation/flocculation polymer aids. Increased ferric doses have been implemented at the WTP based on positive jar test results.



- Increase water main flushing efforts to minimize stagnant water
  - Flushing efforts are ongoing as weather permits.
- Water system modeling to identify areas with high water age and potential solutions
  - The water model has been improved and preliminary results, including system wide water age, have been produced. Water demand updates and reconciliation with operator's data are scheduled for March 2015 to complete water modeling analysis.
  - Cedar Street Pump Station potential recirculation
    - Water model analysis to be completed in March 2015.
  - West Side Pump Station potential recirculation
    - Water model analysis to be completed in March 2015.
  - Storage tank volume use
    - Operating levels of West Side and Cedar Street reservoirs have been lowered to reduce water age.
  - Possible broken closed valve locations
    - Model has been updated with known broken valve locations. Model results are being evaluated for indications of other possible broken valves. City has also initiated valve assessment program.
  - Locations in need of flushing
    - High water age areas have been identified in the water model. Further evaluation forthcoming to determine most effective flushing points.

#### ***Stage 2 – Contingent Actions***

- Fix ozone system
  - Repairs have been made to gauges and programming and the system is producing proper ozone and functioning under manual operation. Further minor repairs are planned for the 1<sup>st</sup> quarter 2015 to allow automatic operation.
- Start feeding coagulation and flocculation polymer aids to lower TOC, if not completed in Stage 1
  - Polymers evaluated by LAN did not demonstrate notable benefit.
  - PVS Technologies evaluated a proprietary polymer that showed little benefit.
- Convert to lime and soda ash softening
  - Cost effective analysis to be developed, if necessary, based on routine operation THM level monitoring.
- Change disinfectant to chloramine or chlorine dioxide until KWA
  - Cost effective analysis to be developed, if necessary, based on routine operation THM level monitoring.
- Install pre-oxidant feed at intake to optimize ozone disinfection
  - Permanganate feed at intake was evaluated by Veolia the week of 2/16/15 and recommendations are expected by the first week in March 2015.
- Replace filter media with granular activated carbon (GAC) media
  - Cost effective analysis to be developed, if necessary, based on routine operation THM level monitoring.
- Implement advanced treatment for THM precursor removal
  - Cost effective analysis to be developed, if necessary, based on routine operation THM level monitoring.
- Water model analysis to be completed in March 2015.



- Continue valve replacements with water model assistance
  - Water model analysis to be completed in March 2015.
- Emphasize cast iron pipes on water main replacement priority list
  - Flint has bid replacement of over 2 miles of 24" cast iron pipe along Dupont and Bishop Streets to be completed this coming construction season. The water main section is considered a critical transmission main, and is expected to contribute to decreases in water age when complete.

THM samples have been taken and tested 5 times since the City began using the Flint River for supply. Four sets of samples were taken for official regulatory compliance and one set of samples was taken by the City for operational monitoring. Samples were taken in May 2014, August 2014, November 2014, January 2015, and February 2015. THM levels at all sample sites have declined from August 2014 to February 2015. The average of all sample sites in August was 142.1 ug/l and the most recent average of samples taken in February 2015 was 19.8 ug/l. The MCL defined by the EPA is 80 ug/l.



## **I. BACKGROUND**

The City of Detroit Water and Sewer Department (DWSD) has historically provided drinking water for the City of Flint and Genesee County. In the late 1990's growing concern regarding the reliability of the DWSD supply prompted the City of Flint to upgrade their existing water treatment plant (WTP). Those improvements, defined as Phase I, were completed in 2005 and were intended to allow the Flint WTP to operate, using the Flint River as the source, for an extended period of time in the event that supply from the DWSD was temporarily interrupted. Additionally, the Phase I improvements set the stage for Flint to break free from dependence on the DWSD supply and water charges over which they had no control.

### **A. WATER SUPPLY TRANSITION**

#### **1. Detroit Water and Sewer Department (DWSD)**

Until recently the Genesee County and Flint region had been provided drinking water by the DWSD. However, due to excessive cost increases and reliability issues with the DWSD system other options had to be explored.

#### **2. Karegnondi Water Authority (KWA)**

In 2010 the Karegnondi Water Authority (KWA) was formed for the purpose of developing a new water supply from Lake Huron to serve the region in lieu of the DWSD supply and the City of Flint elected to join. The KWA expects the new system which is currently being constructed to become operational by the fall of 2016.

#### **3. Flint River – Interim Period**

With a renewing water supply agreement between Flint and the DWSD being terminated by the DWSD (effective April 30, 2014) and the KWA system not expected to be operational until late 2016, the City of Flint decided to initiate operation of the existing WTP full time utilizing the Flint River as the interim water source. A variety of WTP improvements were necessary for the Flint plant to become a full time plant. For purposes of this report, Phase II improvements to the Flint WTP are improvements intended to allow the plant to operate full time with either the Flint River as the source or the KWA supply as the source.

### **B. TTHM VIOLATIONS**

The EPA and MDEQ method of determining if TTHM sample results exceed the MCL uses a locational running annual average (LRAA). Flint's first TTHM violation was cited by the MDEQ following the third cycle of sampling completed in November 2014. Of the 8 sampling sites, 4 were in violation. At that time the MDEQ used the following calculation for determining if the MCL had been violated:

$$(2 \times \text{current quarter value} + \text{previous 2 quarter values}) / 4 = \text{Operational Evaluation Value}$$

Flint has now completed tests for 4 quarters and a straight annual running average applies. Based on samples taken on February 17, 2015 the number of sites in violation of the TTHM MCL limit has decreased to three. The City also conducted a round of sampling on January 27, 2015 in order to internally monitor the progress of actions taken to address the TTHM issue. It is worth noting that each round of sampling since August of 2014 has indicated a significant drop (improvement) in TTHM levels. Test results are tabulated in Table 2. HAA5 sample results are shown in Table 3, of which Flint has had no violations.



**TABLE 2 – TTHM TEST RESULTS (ug/L)**

| Sample Location                      | 1 <sup>st</sup> Qtr<br>5/21/14 | 2 <sup>nd</sup> Qtr<br>8/21/14 | 3 <sup>rd</sup> Qtr<br>11/21/14 | Inter.<br>1/27/15 | 4 <sup>th</sup> Qtr<br>2/17/15 | LRAA |
|--------------------------------------|--------------------------------|--------------------------------|---------------------------------|-------------------|--------------------------------|------|
| WTP Tap                              | 56                             | 86                             | 33                              | 16                | -                              | na   |
| 1) 3719 Davison<br>McDonalds         | 162.4                          | 145.3                          | 58.6                            | 35                | 16.2                           | 95.6 |
| 2) 822 S. Dort Hwy<br>BP Gas Sta.    | 111.6                          | 112.0                          | 36.2                            | 23                | 19.9                           | 69.9 |
| 3) 3302 S. Dort Hwy<br>Liquor Palace | 96.5                           | 127.2                          | 33.3                            | 23                | 16.8                           | 68.5 |
| 4) 3606 Corunna<br>Taco Bell         | 106.4                          | 181.3                          | 33.9                            | 24                | 18.1                           | 84.9 |
| 5) 2501 Flushing<br>Univ. Market     | 75.1                           | 196.2                          | 93.6                            | 35                | 24.5                           | 97.4 |
| 6) 3216 MLK<br>Salem Housing         | 82.2                           | 112.4                          | 50.1                            | 33                | 28.5                           | 68.3 |
| 7) 5018 Clio<br>Rite Aid             | 88.2                           | 144.4                          | 53.6                            | 29                | 19.2                           | 76.4 |
| 8) 6204 N. Saginaw<br>N. Flint Auto  | 79.2                           | 118.3                          | 41.1                            | 21                | 14.9                           | 63.4 |

TTHM MCL = 80 ug/l

**TABLE 3 – HAA5 TEST RESULTS (ug/L)**

| Sample Location                      | 1 <sup>st</sup> Qtr<br>5/21/14 | 2 <sup>nd</sup> Qtr<br>8/21/14 | 3 <sup>rd</sup> Qtr<br>11/21/14 | Inter.<br>1/27/15 | 4 <sup>th</sup> Qtr<br>2/17/15 | LRAA |
|--------------------------------------|--------------------------------|--------------------------------|---------------------------------|-------------------|--------------------------------|------|
| WTP Tap                              | 36 (taken June 14, 2014)       |                                |                                 |                   |                                | na   |
| 1) 3719 Davison<br>McDonalds         | 64                             | 43                             | 16                              | Na                | 9.0                            | 33.0 |
| 2) 822 S. Dort Hwy<br>BP Gas Sta.    | 52                             | 40                             | 21                              | Na                | 9.0                            | 30.5 |
| 3) 3302 S. Dort Hwy<br>Liquor Palace | 48                             | 31                             | 15                              | Na                | 9.0                            | 25.8 |
| 4) 3606 Corunna<br>Taco Bell         | 55                             | 24                             | 15                              | Na                | 9.0                            | 25.8 |
| 5) 2501 Flushing<br>Univ. Market     | 38                             | 17                             | 24                              | Na                | 9.0                            | 22.0 |
| 6) 3216 MLK<br>Salem Housing         | 41                             | 25                             | 5                               | Na                | 2.0                            | 18.3 |
| 7) 5018 Clio<br>Rite Aid             | 49                             | 30                             | 17                              | Na                | 9.0                            | 26.3 |
| 8) 6204 N. Saginaw<br>N. Flint Auto  | 50                             | 37                             | 18                              | Na                | 9.0                            | 28.5 |

HAA5 MCL = 60 ug/l

### **C. WATER TREATMENT PLANT RECENT IMPROVEMENTS & STATUS**

#### **1. Phase I WTP Improvements**

Since 1965, the Flint WTP has remained a secondary or backup supply system to the DWSD primary supply. Typically the secondary supply for a public water system is expected to be needed only during emergency situations and normally is designed for short term operation such as providing the average daily demand for a few days. Conversely, Phase I improvements were designed with the intent to upgrade the Flint WTP in order to allow for an extended short term period (6 weeks) because of the perceived high risk that the DWSD supply would fail and remain out of service for an



extended duration. Regardless, the Flint WTP was still intended to serve as a standby plant and as such the Phase I improvements lacked redundancies that would be required for a primary supply WTP.

## 2. Past Pilot Study & Testing

During design of the Phase I improvements a treatability study was completed by Alvord, Burdick & Howson, LLC (AB&H) in 2002. The Treatability Study evaluated the current treatment processes that are in place at the Flint WTP today with the Flint River as the source. The report recommended the following:

**TABLE 4 – 2002 WTP TREATMENT RECOMMENDATIONS**

| Treatment           | Purpose                            | Point of Application | Dosage (mg/l) |
|---------------------|------------------------------------|----------------------|---------------|
| Sodium permanganate | Zebra mussel control               | Intake               | 0.3           |
| Ozone               | Taste & odor removal, disinfection | Diffuser basin       | 1.5           |
| Ferric chloride     | Coagulation                        | Rapid mix            | 40            |
| Coag aid polymer    | Turbidity & TOC removal            | Rapid mix            | 2.0           |
| Floc aid polymer    | Turbidity & TOC removal            | Floc basin           | 0.05          |
| Lime                | Softening                          | Softening basin      | 175           |
| Soda ash            | Softening                          | Softening basin      | 52            |
| Carbon dioxide      | pH adjustment                      | Recarb basin         | 37            |
| Media filters       | Filtration                         | N/A                  | Na            |
| Chlorine            | Disinfection                       | Filter effluent      | 1.0           |

Of the recommended items, zebra mussel control, coagulant and flocculation polymer aids, and soda ash feed have not been incorporated into the treatment process.

## 3. Phase II WTP Improvements for Full Time Operation

Phase II WTP improvements are those needed to convert the Flint WTP from a back-up supply to a primary supply plant. A number of improvements have already been constructed as they were necessary to operate full time when treating water from the Flint River. The improvements under the title of Phase II that have been completed or are nearly complete include installation of the future raw water feed connection point and valving for the KVA supply, upgrades to the lime sludge lagoon, the lime sludge lagoon decant and disposal system, decant pump station and force main, installation of mid-point chlorination before filtration, and upgrade of the electric feed substation.

Additional improvements to the Flint WTP that are to be completed to become part of the normal treatment process using water supplied by the KVA are:

- New oxygen and nitrogen storage facilities for the ozone system (under construction)
- New coagulant feed system
- Electrical
  - Pump Station #4 upgrades (under construction)
  - SCADA and controls upgrades
  - Filter transfer pump station feeders
- Pump replacements and VFD installation in the low and high service pump station (under construction)
- Filter transfer pump station to Dort Reservoir
- Facility security improvements





## II. SOURCE WATER EVALUATION

### A. DATA ANALYSIS

Based on past data collected and the 2002 Treatability Study by AB&H, the Flint River water quality varies seasonally with higher hardness and alkalinity experienced in the winter. Higher magnesium concentrations are also experienced in the winter, adding difficulty to the settling process due to neutrally buoyant floc. General water quality average characteristics recorded for the 2002 Treatability Study as compared with average characteristics recorded in 2014 are shown in Table 5 below.

| TABLE 5 – FLINT RIVER WATER QUALITY CHARACTERISTICS |                  |                 |              |                                          |     |                           |               |
|-----------------------------------------------------|------------------|-----------------|--------------|------------------------------------------|-----|---------------------------|---------------|
| Period                                              | Turbidity<br>NTU | TOC<br>Mg/l     | Alk.<br>Mg/l | Hardness<br>Mg/l as<br>CaCO <sub>3</sub> | pH  | Total Col.<br>Count/day   | THMFP<br>Mg/l |
| 2001<br>Apr–Oct                                     | 7.9              | 9.4             | 215          | 272                                      | 8.1 | 870-1230<br>(7300 max)    | 410           |
| 2014<br>May–Oct                                     | 8.3              | 10.3<br>5/22/14 | 207          | 252                                      | 8.2 | 1900-9000<br>(48,300 max) | 187           |

The Flint River characteristics do not appear to have changed significantly over the past 10+ years. Note that further investigation by City staff revealed a sewer leak upstream of the plant that may have contributed to the total Coliform count. The leak was subsequently repaired.

### B. CONCLUSIONS

Considering the minor changes in Flint River water quality, much of the information contained in the 2002 Treatability Study by AB&H remains relevant today. Data from that report assumed to be consistent today include the following:

- Flint River is influenced by groundwater from a dolomitic aquifer
- Hardness varies seasonally with higher hardness and alkalinity in the winter
- Hardness, alkalinity, magnesium concentrations tend to be reduced by run-off

In development of the 2002 Treatability Study, processes were simulated which resulted in low THM levels. Therefore, information contained in that report will be used to assist with establishing a baseline jar testing procedure as discussed further in Section III.



### III. TREATMENT PROCESS EVALUATION

#### A. EXISTING PROCESS DESCRIPTION

The existing WTP consists of an intake with screening from the Flint River, low lift pumping, ozonation, rapid mix, flocculation, settling, softening, recarbonation, filtration, storage and high service pumping. A process diagram is shown as Figure 1.

##### 1. Intake

A 72" diameter pipe draws water from the Flint River through 2 traveling screens to the low lift pump structure. No chemicals are currently fed for Zebra mussel control or pre-oxidation as recommended by the 2002 Treatability Study. Manual removal of zebra mussels is more economical than installation of chemical feed equipment considering the short term need.

##### 2. Ozone

There are 2 ozone generators designed to provide adequate ozone for a WTP flow of up to 36 mgd. There are 3 ozone contact basins. The ozone generators were designed to produce 900 lbs/day at 10% concentration and up to 1300 lbs/day at 6% concentration each. Prior to recent repairs, readings indicated a production rate of approximately 700 lbs/day at 4% concentration. It is possible that before the recent improvements the ozone feed might not have been optimized. In fact, it is known that less than optimal ozonation previously led to increased chlorine feed which would have contributed to THM formation.

##### 3. Rapid Mix

East and West rapid mix chambers allow chemical feed prior to the flocculation basins. Each rapid mix chamber is equipped with a 5 hp mixer.

##### 4. Coagulation / Flocculation

The WTP contains two equally sized flocculation basins, east and west, and each basin provides tapered or gradually slowed mixing from inlet to outlet. There are fifteen 2 hp mixers for each basin with VFDs to control mixing speed. The 2002 Treatability Study recommended feeding both coagulation and flocculation polymer aids. Neither polymer aid is being used today because turbidity and TOC removals have been sufficient to meet regulatory requirements.

##### 5. Settling

Primary clarification takes place within 3 basins containing plate settlers. The settlers are operating as designed.

##### 6. Softening

Again, there are two basins for softening: east and west. Each basin is 120' in diameter and contains a solids contact softening unit. Each softening basin/unit has a design capacity of 18 mgd. The east clarifier has an effluent weir imbalance that the City intends to fix when low demands allow for construction. Low lift pumping limitations, flow control to the basins, control restrictions on residuals removal, and fluctuating demands have made it difficult for WTP staff to stabilize the softening process. Softening is accomplished by feeding lime. The decision was made by the City not to feed soda ash in order to remove non-carbonate hardness because acceptable hardness levels could be achieved with lime feed only and softening is short term until Lake Huron water becomes available. Lime and soda ash softening is a possible consideration to assist with TOC removal and thus reduce THM formation.





#### **7. Recarbonation**

Recarbonation for pH adjustment is accomplished in east and west recarbonation basins between and to the north of the softening basins. Carbon dioxide storage and feed equipment is located west of the recarbonation basins.

#### **8. Filtration**

Filtration is accomplished with 12 dual media filters, equally sized and designed to filter 3.0 mgd each. Media consists of 12" of sand and 18" of anthracite. The filters have been operated intermittently over the years due to the standby nature of the WTP and until recently, chlorine injection took place downstream of the filters. It is possible some microbial growth had developed in the filters leading to increased chlorine demand. The City recently hired a contractor to upgrade the electrical controls for the filters and that work has been completed.

#### **9. Disinfection**

Disinfection is provided by ozonation and by feeding chlorine. Ozonation occurs at the front end of the WTP. Chlorine is fed prior to filtration and prior to finish water storage / high service pumping. The intermediate chlorine injection location was recently constructed under the Phase II, Segment 1 contract.

#### **10. Clear Well & Pumping**

The pump building sits adjacent to a 3-MG clear well and contains both low and high service pumps.

### **B. JAR TESTS / EXPERIMENTS**

#### **1. Approach**

There are several well practiced methods by which DBPs can be reduced. First, the disinfectant can be changed to an alternate that has a lower tendency to form DBPs. Second, additional treatment systems such as activated carbon or air stripping (depending on the nature of the precursors) can be added to remove DBP precursors. Lastly, the existing treatment processes can be optimized to remove as much DBP precursor as possible. Of these options, optimizing existing treatment processes is the only strategy that does not require the construction of new and expensive facilities. It is anticipated that Flint will be receiving Lake Huron water in approximately two years and this water will have a completely different chemistry from the Flint River. Major process changes instituted to address THM levels using Flint River water are likely to be unnecessary for Lake Huron water and may even be inappropriate. Therefore, those options which require addition of new treatment processes are undesirable at this time. In recognition of this upcoming change in water source, efforts for this study have concentrated on improving the existing processes, rather than adding new ones. New treatment processes will only be recommended if operational changes to the existing treatment train prove ineffective.

Recent sample test results suggest that most of the DBPs are formed in the distribution system rather than within the treatment plant. Therefore, the most logical approach is to reduce the DBP formation potential (DBFP) rather than simply lowering the levels of DBPs leaving the plant. During bench scale testing, formation potential (FP) levels were the primary indicator of success or failure of proposed process modifications.

#### **2. Protocol**

Bench scale pilot testing is intended to reflect actual plant operating and hydraulic conditions so the bench scale treatment units were sized based on various dimensionless factors to ensure the pilot treatment matched the actual system. Bench



scale ozonation was not practical due to time and cost limitations. Therefore, water samples were withdrawn from the plant ozone basin effluent. These samples were transported to the laboratory and dispensed into square testing jars. The jars were used to simulate rapid mix, three-stage flocculation, and settling. Rapid mix and flocculation conditions were matched to the plant based on "Gt" values. The "G" value is a measure of the mixing intensity and is a function of mix time, viscosity of the liquid, and mixing power applied to the water. "Gt" then, is a size scaling factor where time has been accounted for. Settling time was scaled to match the shorter settling depth of the testing jars. After settling, samples were decanted from the test jars. The decanted samples were then lime softened; softening conditions were similarly matched on the basis of "Gt". Carbon dioxide was sparged into the samples to reduce the pH. The water was then vacuum filtered through filter paper, sized to simulate the plant's dual media filters. The samples were dosed with excess chlorine and allowed to react for seven days at 25° C before testing for DBPs to determine the formation potential.

The following conditions were applied during testing to properly match small scale testing to actual plant processes.

**TABLE 6 – BENCH SCALE TEST MIXING INTENSITIES**

| Process               | G     | Duration | Mix RPM |
|-----------------------|-------|----------|---------|
| Ozonation             | Plant | -        | -       |
| Rapid Mix             | 200   | 44 sec   | 160     |
| Flocculation, Stage 1 | 50    | 9 min    | 55      |
| Flocculation, Stage 1 | 25    | 9 min    | 30      |
| Flocculation, Stage 1 | 12    | 9 min    | 19      |
| Settling              | N/A   | 10 min   | -       |
| Softening             | TBD   | 10 min   | -       |
| Recarbonation         | N/A   | N/A      | -       |

The primary variables during testing were chemical additions and chemical dosages. Specific chemicals and dosages used for initial testing conditions were selected to reflect current plant usage and the recommendations of the 2002 Treatability Study:

**TABLE 7 – BENCH SCALE TEST CHEMICAL FEED RATES**

| Chemical                   | Current Usage | 2002 Study   | Test Values                  |
|----------------------------|---------------|--------------|------------------------------|
| Ozonation                  | 4.66 mg/l     | 1.5 mg/l     | -                            |
| Ferric Chloride            | 7.7 mg/l Fe3+ | 40 mg/l Fe3+ | 7.7 – 80 mg/l Fe3+           |
| Coagulant Aid Polymer      | Not used      | 2.0 mg/l     | 1 – 2 mg/l                   |
| Flocculation Aid Polymer   | Not used      | 0.05 mg/l    | 0 – 0.05 mg/l                |
| Powdered Activated Carbon  | Not used      | N/A          | 20 – 100 mg/l                |
| Lime                       | 120 mg/l      | 175 mg/l     | 120 – 175 mg/l               |
| Soda Ash                   | Not used      | 52 mg/l      | 0 – 52 mg/l                  |
| Cationic Softening Polymer | 3.13 mg/l     | Not used     | 3.13 mg/l                    |
| Anionic Softening Polymer  | 0.88 mg/l     | Not used     | 0.88 mg/l                    |
| Fluoride                   | 0.45 mg/l     | 1 mg/l       | Not used                     |
| Carbon Dioxide             | 32 mg/l       | 37 mg/l      | Fed to reach pH of 7.5 ± 0.3 |
| Chlorine                   | 6.3 mg/l      | 1 mg/l       | 10 mg/l                      |



### 3. Considerations

The 2002 Treatability Study did not note significant formation of DBPs. This may be a function of different Flint River water chemistry at that time. However, recognizing the considerable differences in chemical usage and dosages between that study and current operations, those differences in chemical use and dosage are an obvious starting point for optimizing treatment to prevent DBP limit exceedance.

Although it is believed that optimization of current treatment can correct the DBP issue, should optimization of present treatment prove insufficient, alternate residual disinfectants (chloramines and chlorine dioxide) will be investigated as additional treatment measures.

### 4. LAN Test Results

Two rounds of jar testing were completed by LAN during the weeks of December 15, 2014 and January 26, 2015. Detailed test data is included in Appendix A. Testing results can be summarized as follows:

- Increased dosages of ferric chloride resulted in higher reduction of THMFP.
- The currently utilized feed rate of lime at 120 mg/l is appropriate.
- Softening with soda ash in addition to lime resulted in minor additional THMFP reduction -- in the range of 0% - 10%.
- The benefits of using a cationic polymer during softening at a dosage range of 0.31 - 3.13 mg/l to help reduce THM's are unclear.
- The benefits of using an anionic polymer during softening at a dosage range of 0.09 - 0.88 mg/l to help reduce THM's are unclear.
- Feeding PAC was ineffective in reducing THMFP within the dosage range of 20 - 100 mg/l.

### 5. Testing by Others

In addition to jar testing completed by LAN, the chemical supplier who provides ferric chloride for the City, PVS Technologies, ran tests using their recommended flocculant polymer aid. Plus, Veolia Water completed jars testing of their own the week of February 16<sup>th</sup> to analyze other process details and current WTP parameters. Experiments completed by PVS Technologies showed very little TOC removal beyond that obtained with straight ferric chloride feed.

### 6. Conclusions

Increasing the dose rate of ferric chloride is an operational change that can easily be implemented without the need for any additional equipment. Test results show that over 40% THMFP removal can be obtained with a dosage of 60 mg/l  $Fe^{3+}$  or higher. Increased dosing of ferric chloride would be most ideal coupled with regular raw water TOC monitoring so that TOC levels would dictate the appropriate ferric chloride feed rate.

Softening with soda ash in addition to lime is another option the City should consider if increased ferric chloride doses are not adequate to maintain THM levels under the MCL, particularly during warmer months. Again, monitoring of TOC in the raw water could provide useful information of when lime/soda ash softening is necessary.



#### IV. DISTRIBUTION SYSTEM EVALUATION

EPA guidance for the distribution evaluation portion of an OER is focused on identification and isolation of a specific portion of the distribution system that led to the exceedance. The circumstances of Flint's apparent pending TTHM exceedances are unusual in that a new supply has been implemented which clearly corresponds to the high TTHM sample results. Although the new source is one element in increased TTHM levels, value remains in evaluating the distribution system since water age is also a critical factor. Additionally, there may be distribution improvements that can be made to help alleviate the problem.

##### A. INFRASTRUCTURE

###### 1. Piping

According to the most recent MDEQ Sanitary Survey, the distribution system is estimated to contain 70% cast iron, 20% ductile iron, 2% concrete and 8% steel water mains. Unlined cast iron pipe can become pitted, allowing colonization sites for microorganisms leading to chlorine demand. Additionally, much of the piping in the system is aged and in poor condition. Increased chlorine demand could be resulting from biofilm in older pipes and from main breaks/repairs. The extent of contribution is not known but any water main replacement project will decrease chlorine demand somewhat if constructed properly. Unfortunately, water main breaks may also assist with decreasing water age by providing unintentional flushing. All things considered, it is impossible to quantify the impact existing piping has on TTHM formation.

The City utilizes City Point software and GPS equipment to document main breaks and prioritize replacements. However, main break information is more pertinent to rusty water complaints and has little relevance to TTHM levels. Areas that have been targeted for main replacements include the transmission main from the WTP west to Dupont and south to the West Side reservoir, Fenton Road, Atherton Road, Dort Highway, Averil Street, and Boulevard Drive.

###### 2. Storage

There are 4 finish water storage tanks and 1 raw water tank as tabulated below:

| TABLE 8 – STORAGE TANKS |          |          |             |           |       |          |       |
|-------------------------|----------|----------|-------------|-----------|-------|----------|-------|
| Name                    | Type     | Water    | Volume (MG) | Operating |       | Absolute |       |
|                         |          |          |             | LWL       | HWL   | Bottom   | Of    |
| Dort Reservoir          | Ground   | Raw      | 20          | -         | -     | 730      | 750   |
| WTP Tank                | Elevated | Finished | 2           | 853.0     | 896.0 | 863.0    | 898.0 |
| WTP Clear Well – P5 #4  | Ground   | Finished | 3           | 11'       | 15'   | 708.5    | 726.0 |
| Cedar Street Reservoir  | Ground   | Finished | 20          | -         | 11'   | 737.2    | 757.2 |
| Westside Reservoir      | Ground   | Finished | 12          | -         | 12'   | 761.8    | 779.0 |

The MDEQ typically recommends providing a minimum finish water storage volume of 1/3 the maximum daily demand (MDD). According to the 2013 MDEQ Sanitary Survey, the 5 and 10 year MDDs are 21.57 mgd and 30.05 mgd respectively. A common rule of thumb for clear well storage volume at a WTP is 10% of the design flow rate. Another general guideline for reliability is to provide total storage to allow for 2 X the average daily demand plus fire flow demand. For this analysis, fire flow is assumed to be 2,500 gpm for either one industrial fire (2,500 gpm) or a combination of one residential (1,000 gpm) and one commercial (1,500 gpm) fire at a 4 hour duration which results in a total volume of 600,000 gallons. These go-by



approximations are summarized below with the applicable flow rates and are compared to the existing storage volumes currently being utilized.

| <u>Common Practice</u>        | <u>Flow Rate</u> | <u>Recommended<br/>Volume by ROT</u> | <u>Volume In<br/>Use</u> |
|-------------------------------|------------------|--------------------------------------|--------------------------|
| Clear well 10% of Design Flow | 18 MGD           | 1.8 MG                               | 3.0 MG                   |
| Finish Storage = 1/3 MDD      | 30.05 MGD        | 10.0 MG                              | 37 MG                    |
| Total Storage = 2 * ADD + FFD | 13.87 MGD        | 28.3 MG                              | 57 MG                    |

Based on the values above, it appears the storage volume used in the Flint system could be decreased without negatively effecting reliability. The appropriate volumes of individual tanks will be further evaluated using the water system model and discussed in Section V (C).

All reservoirs have baffling to minimize stagnant water. Also, all tanks have been maintained and are in reasonable condition. The Westside reservoir has an exposed roof that is in need of rehabilitation, but its current condition has no influence on THM formation.

### 3. Pump Stations

All pump stations are in good condition but pumps are generally oversized. As an independent consideration, oversized pumps are not a contributing factor to high THM levels. Control of pumps and pressure zones are discussed in detail below.

## B. OPERATIONS AND MAINTENANCE

### 1. Pump Station & Storage Operations

Pump stations and storage tank levels are controlled as shown in Table 9.

| TABLE 9 – PUMP STATION CONTROLS |                                 |                 |                  |
|---------------------------------|---------------------------------|-----------------|------------------|
| <u>PS Name</u>                  | <u>Control Point</u>            | <u>On Point</u> | <u>Off Point</u> |
| PS No. 4 Raw                    | Operator                        |                 |                  |
| PS No. 4 Finish                 | Match plant flow                |                 |                  |
| Westside                        | System pressure (elevated tank) | 22.5'           | 33'              |
| Cedar Street                    | System pressure (elevated tank) | 22.5'           | 33'              |
| Torrey Road                     | Distr. – Brown/Bradley          | < 45 psi        | > 45 psi         |

Cedar Street and Westside pump stations are operated as needed and they are alternated. Typically, Cedar Street is run in the morning and Westside is run in the evening and reservoirs for each are filled during low demand periods at night.

Westside, Cedar Street and Torrey Road pump stations are used to boost system pressure when high demands warrant it, but there are not well defined pressure zones within the system. Therefore, the possibility exists that water is being recirculated allowing for increased water age.

### 2. Booster Disinfection Practices

Booster disinfection is provided at the Cedar Street and Westside pump stations. When sustained residuals are not provided by chlorine feed at the WTP, sodium hypochlorite is applied at the reservoirs while being filled.





### 3. Changes in System Demands

Water demands in the City have been declining since the 1960's as the population has dropped. As a result, many of the water system components are oversized including storage tanks and water mains which both increase the time for water to reach the user.

From a short term perspective, Flint demands tend to increase in summer as is ordinarily expected but also in the winter due to water main breaks. The MDD for Flint often occurs in winter. Regarding THM formation, with lower temperatures and higher flows in the winter, THM levels taken at the distribution sample points are expected to be lower than at other times of the year.

## C. WATER SYSTEM HYDRAULIC MODELING

As part of this report, the City provided a hydraulic water model, originally developed by Potter Consulting, for LAN to update. Thus far, LAN has modified the model to be capable of extended period simulations, modified controls to reflect current operations, revised the piping to include known broken valve locations, and developed preliminary water age results throughout the entire system. Water age shown in the updated model corresponds well to THM levels at 6 of the 8 sampling sites. However, LAN has also identified several deficiencies within the model that require further adjustments to allow for usable and reliable results. Those model deficiencies include outdated demands, improperly located appurtenances, and incorrect flow patterns. Preliminary water age results are presented in Table 10. Revised results will be provided when the hydraulic model has been fully updated.

TABLE 10 – PRELIMINARY WATER AGE FROM WATER MODEL

| Sample Point | Location       | Address          | Water Age (Hrs) | Aug 2014 THM (ug/l) |
|--------------|----------------|------------------|-----------------|---------------------|
| 1            | McDonalds      | 3719 Davison     | 23              | 145                 |
| 2            | BP Gas Station | 822 S. Dort Hwy  | 18              | 112                 |
| 3            | Liquor Palace  | 3302 S. Dort Hwy | 15              | 127                 |
| 4            | Taco Bell      | 3606 Coruna      | 128             | 181                 |
| 5            | Univ. Market   | 2501 Flushing    | 178             | 196                 |
| 6            | Salem Housing  | 3216 MLK         | 50              | 112                 |
| 7            | Rite Aid       | 5018 Clia        | 78              | 144                 |
| 8            | N. Flint Auto  | 6204 N. Saginaw  | 71              | 118                 |

It is anticipated that topics shown below in italicized font will be detailed after the model is updated in March 2015.

### 1. *Simulation of Existing System*

*Match existing conditions. Chlorine and THM data may be used to verify model results. We have chlorine feed data at plant and residuals at 10 locations in each MOR, May 2014 – January 2015.*

### 2. *Identification of Water System Deficiencies*

*Specific issues to look at:*

*Worst case at minimum daily demands*

*Water age in entire system*

*Recirculating water through pump stations*

*Use of storage tanks – volumes in particular*

*Indications of broken valves*

*Effectiveness of booster disinfection*



## V. RECOMMENDATIONS TO MINIMIZE FUTURE OEL EXCEEDANCES

### A. SOURCE

The City of Flint has already committed to the change from the Flint River as the water source to Lake Huron under the KWA system, planned for late 2016. The risk of future THM limit violations will decline substantially with the use of water from Lake Huron due to much lower DBP precursors. It is important to recognize that the Flint River will become strictly an emergency supply when the KWA supply becomes available and any investments toward the Flint River should be contemplated accordingly. Recommendations discussed below in this section apply to the Flint River as the source.

Reverting to supply from the DWSD until the KWA supply is available as an option. However, based on information provided by the City of Flint, the annual cost to receive water from the DWSD would be at least \$16,000,000/year or \$1,333,000/month. Therefore, utilizing the DWSD for interim supply is cost prohibitive under the terms defined by the DWSD.

#### 1. Watershed Management

A volunteer group entitled the Watershed Coalition performs various tasks related to managing the Flint River watershed such as spring cleanups and annual benthic studies to evaluate the river 'health'. No additional action is recommended at this time.

#### 2. Monitoring

The City documents daily raw water flow, pH, alkalinity, carbonate and non-carbonate hardness, chloride, temperature, turbidity and coliform count as part of standard preparation of Monthly Operating Reports (MOR). It is recommended to add raw water TOC and plant tap THM values to daily documented measurements which would provide staff the data needed to establish correlations to predict distribution system THM formation.

#### 3. Intake Operations

The 2002 Treatability Study recommended pre-oxidation in the form of sodium permanganate as a feed at the intake. It is possible the addition of a pre-oxidant such as hydrogen peroxide or some type of permanganate could enhance the ozone process. Veolia evaluated permanganate demand during jar testing the week of February 16<sup>th</sup>, 2014 and further recommendations will be incorporated when results become available.

#### 4. Seasonal Strategies

Past data indicates the Flint River is influenced by groundwater and in particular, dolomitic spring water. The result is hard water with high concentrations of magnesium and sulfate. Also, hardness and alkalinity are higher during the winter. Upon initiation of supply from the Flint River, the City made the decision to soften with just lime to focus on removal of carbonate hardness. One potential modification that could assist with TOC removal and thus decrease THMFP would be lime and soda ash softening. A temporary caustic soda feed system is recommended to be put in place in case the need for optimized softening arises.

#### 5. Upstream Contamination Issues

Upstream contamination issues are extremely difficult to prevent and even if detected are difficult to locate. Evaluation of raw water data collected for MORs is the easiest



manner in which to detect upstream contamination issues because the data is already collected for treatment purposes. In fact, high total Coliform readings signaled a potential issue recently that the City identified and removed.

An upstream monitoring and warning system could be established to attempt to detect water quality issues or spill event type contamination early enough to adjust treatment procedures or cease intake prior to the contamination reaching the WTP. However, given the imminent conversion to the KWA supply, the period of full time use would likely be far too short to achieve payback on the capital expenditures.

## B. TREATMENT PROCESS

### 1. Operational Recommendations

- Increase ferric chloride dosage: Previous testing in the 2002 Treatability Study, jar testing completed by LAN, and a review of 2014 ferric chloride dosages compared to THM levels leaving the WTP support that increasing the ferric chloride dosage would help reduce THM formation.
- Increased monitoring: Currently, the MDEQ does not require daily reporting of raw water TOC or finished water TTHM levels. However, daily tracking of such levels would allow the City to develop a correlation between the two, thus providing a predictive tool to help manage TTHM levels.
- Coagulation and flocculation polymer aids: The 2002 Treatability Study suggested the use of coagulation and flocculation polymer aids. These polymer aids were shown in the 2002 Treatability Study to increase TOC removal and thereby reduce THMFP. Further evaluation will be completed during jar testing.
- Discontinue softening bypass: The City was previously bypassing a portion of flow around the softening basins because hardness levels did not warrant softening of the full stream. However, this practice was discontinued because it was believed the bypass stream was contributing to chlorine demand and preliminary data has supported that belief. Chlorine demand dropped 0.5 – 1.0 mg/l following elimination of the bypass stream in early November 2014.
- Softening with lime and soda ash: Research has shown that enhanced softening with both lime and soda ash may provide additional TOC removal. The efficacy of this option will be evaluated during jar testing.
- Disinfection of filter beds: In case there has been microbial growth it is recommended the filters be 'shock' treated with chlorine and rinsed. A chlorine injection point was added upstream of the filters during the first segment of Phase II so future growth in the filters should not be an issue.
- Optimization of all existing treatment processes: Depending on bench scale testing conditions and results, slight modifications to all treatment processes might in order to replicate lower DPBFP.
- Discontinue or adjust softening anionic polymer feed: Some anionic polymers have been found to increase TOC. Veolia evaluated the anionic polymer currently being fed during their jar testing and depending on the results, when available, the softening anionic polymer feed should be adjusted accordingly.





## 2. Infrastructure Change Recommendations

- Fix and/or replace faulty ozone equipment: Since the ozone equipment was installed it has not been used extensively so the hope is that major components remain in good condition and the system can be easily modified to restore proper functionality. The City has scheduled the equipment manufacturer to field inspect the system on December 15, 2014.
- Replace filter media with GAC media: GAC media could help reduce THM levels by reducing both TOC and chlorine demand. For this consideration, the recommended approach would be to first complete small scale testing to verify efficacy. Upon positive results, the next step would be replacement of media in a fraction of the filters following by sampling to measure water quality. Those results would determine the need to replace media in additional filters.
- Change disinfectant to chloramine or chlorine dioxide: If other options prove to be ineffective, conversion to another disinfectant should be fully evaluated. Various characteristics of chloramination indicate an advantage over chlorine dioxide, but a full analysis would provide clarity as to which would be preferred.
- Install pre-oxidant chemical feed: Hydrogen peroxide or a form of permanganate as a pre-oxidant can enhance the activity of the ozone. Chemical feed could be installed at the intake structure or low service pump station, depending on the reaction time required. Use of a pre-oxidant at the intake might also provide the additional benefit of disinfection credit for ozonation with the MDEQ if an ozone residual can be obtained at the ozone process effluent as a result.
- Repair upstream sewer leak: a sewer leak upstream of the WTP intake was discovered and has already been repaired by the City.

## C. DISTRIBUTION SYSTEM

Potential distribution issues related to water quality issues discussed in Section IV included old cast iron pipe, oversized infrastructure, and remote storage/pump station locations and operations that might be less than ideal. Recommendations to address those issues are offered in this section.

### 1. Manage Water Age

#### a) Storage Tanks

Considering the excess storage capacity discussed in Section IV, in the short term it is recommended that operational changes be implemented immediately to reduce the overall volume of water stored to decrease water age. Immediate operational recommendations include lowering high water levels of reservoirs other than the elevated tank, to reduce the total system wide usable storage volume to 30-36 MG.

In the long term, LAN recommends development of the most ideal options for water model evaluation. Excess storage volume and tank locations within the water system afford Flint numerous options to reduce the amount of storage volume utilized. As a starting point, two recommendations are presented below.



Option 1

- Take West Side reservoir and pump station out of service
- Cut storage volume used in half at Cedar Street reservoir
- Reduce the utilized storage volume of the WTP clearwell from 3 MG to 2 MG
- Adjusted system wide storage volume would be 34 MG

Option 2

- Take Cedar Street reservoir and pump station out of service
- Reduce the utilized storage volume of the WTP clearwell from 3 MG to 2 MG
- Adjusted system wide storage volume would be 36 MG

**b) Residence Time in Pipes**

Completely redesigning and replacing the water system to match today's demands is not feasible financially and would be a waste of infrastructure with remaining useful life. Going forward, it is recommended that any future main replacement projects be evaluated for possible downsizing. When the water model is fully updated, it will provide a valuable tool in determining which mains can be downsized and to what extent. Replacement of broken valves and valve exercising are also recommended, which are programs that have already been implemented into Flint's regular operations.

Operationally, hydrant flushing is recommended as needed to minimize water age in low flow areas. Again, the updated water model should be used to locate high water age areas and optimal flushing points.

**2. Reduce Disinfectant Demand**

Recommendations to reduce disinfectant demand are similar to those described above to reduce water age. Replacement of old cast iron pipes would lead to a reduction of disinfectant demand on the distribution side, but realistically can only be accomplished over a prolonged period of time. In the meantime, hydrant flushing is the most viable means of reducing disinfectant demand in piping. From a storage standpoint, all reservoirs and tanks should be regularly inspected and maintained to prevent entrance of any outside contamination that would contribute to disinfectant demand.

**3. Water Modeling of Recommendations (yet to be completed)**

*Determine best flushing locations to reduce water age*  
*Evaluate changes in storage tank operations to reduce water age*  
*Valves to close/add to improve pressure zones, reduce recirculation*  
*Optimization of pump station use – smaller pumps? Shut down?*  
*Evaluate booster disinfection*

**D. BOOSTER DISINFECTION**

Decreasing chlorine feed at the WTP and adding booster disinfection in the distribution system is an alternative intended to reduce the reaction time at higher concentrations of chlorine to reduce DPB formation. Extensive looping and branching within the existing system complicate how to best implement and utilize booster disinfection. Water system modeling is recommended to gage the effectiveness of existing feed point locations and dosages. Further discussion and details will be provided when the distribution evaluation results are available.



## E. CATEGORIZATION OF ACTIONS

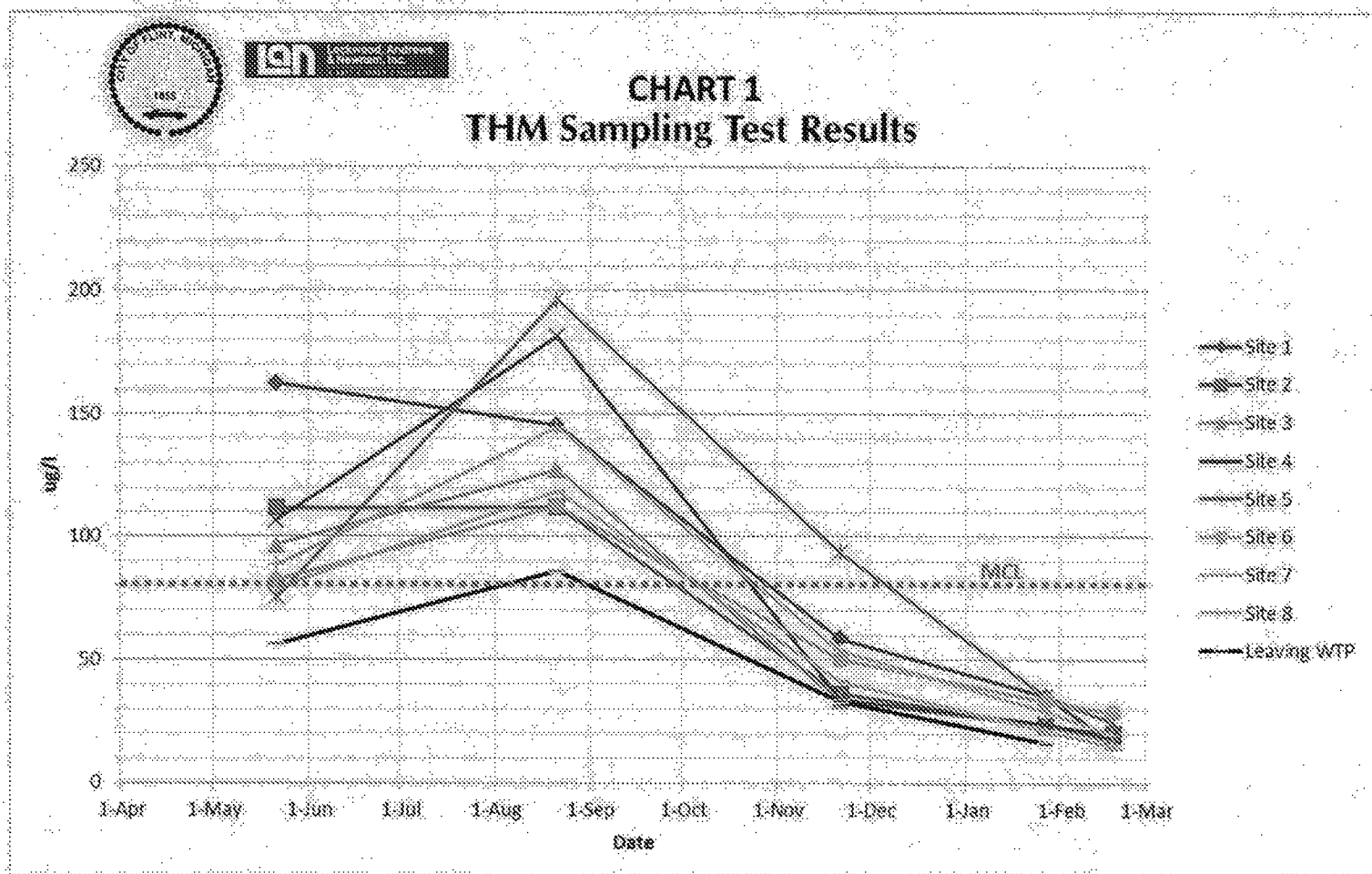
Considering that the Flint River is being used as the water source only until the KWA supply is available (expected late 2016), options to address high THM formation that require new construction or extensive time to implement are not preferred. On the other hand, the City understands THM sample results to date dictate that some action is necessary. Two categories have been developed to assist the City in prioritizing actions to take. Stage 1 consists of actions that can be completed relatively quickly without major construction and Stage 2 actions are either long term actions or solutions requiring major construction. Stage 1 actions are to be completed first followed by evaluation of the results prior to consideration of Stage 2 actions. Grouping of actions are shown in the table below.

| TABLE 11 – ACTION PLAN |                                                                    |                                                                                         |
|------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|                        | Action                                                             | Purpose                                                                                 |
| Stage 1                | Hire water consultant to complete 'water audit'                    | Third party review of actions and operations to make sure no options are being missed   |
|                        | Increased water quality monitoring -- obtain THM and TOC analyzers | Provide information needed to adjust WTP operations to match changing raw water quality |
|                        | Troubleshoot ozone feed system                                     | Reduce chlorine feed and increase TOC removal                                           |
|                        | Bench scale jar testing                                            | Optimize treatment process and evaluate possible modifications                          |
|                        | Discontinue softening bypass                                       | Reduce chlorine demand                                                                  |
|                        | Disinfect filters                                                  | Reduce chlorine demand                                                                  |
|                        | Increased water main flushing                                      | Reduce water age / stagnant water                                                       |
|                        | Water system modeling evaluation                                   | Determine areas with high water age and reasons                                         |
|                        | Implement coag. & floc. polymer aids, if appropriate               | Increase TOC removal                                                                    |
| Stage 2                | Modify booster disinfection feeds, if appropriate                  | Decrease water age                                                                      |
|                        | Repair ozone system                                                | Reduce chlorine feed and increase TOC removal                                           |
|                        | Continue increased water main flushing                             | Reduce water age / stagnant water                                                       |
|                        | Convert to lime and soda ash softening                             | Increase TOC removal                                                                    |
|                        | Continue valve replacements based on water model                   | Reduce water age / stagnant water                                                       |
|                        | Replace filter media with GAC                                      | Reduce TOC and chlorine demand                                                          |
|                        | Change disinfectant to chlorine dioxide                            | Reduce THMFP                                                                            |
|                        | Install pre-oxidant feed at intake                                 | Optimize ozone disinfection, reduce chlorine                                            |
|                        | Place priority on replacing cast iron water mains                  | Reduce chlorine demand                                                                  |

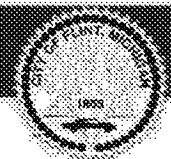
Samples were taken the week of February 16<sup>th</sup> for the 4<sup>th</sup> round of quarterly testing. The City has implemented many of the Stage 1 actions and THM test results have significantly improved (decreased) each time samples have been taken since August 2014. In addition to the regular compliance monitoring, the City performed a round of sampling on January 27, 2015. All sampling results are shown on Chart 1.



**CHART 1**  
**THM Sampling Test Results**







## APPENDIX A JAR TEST DATA

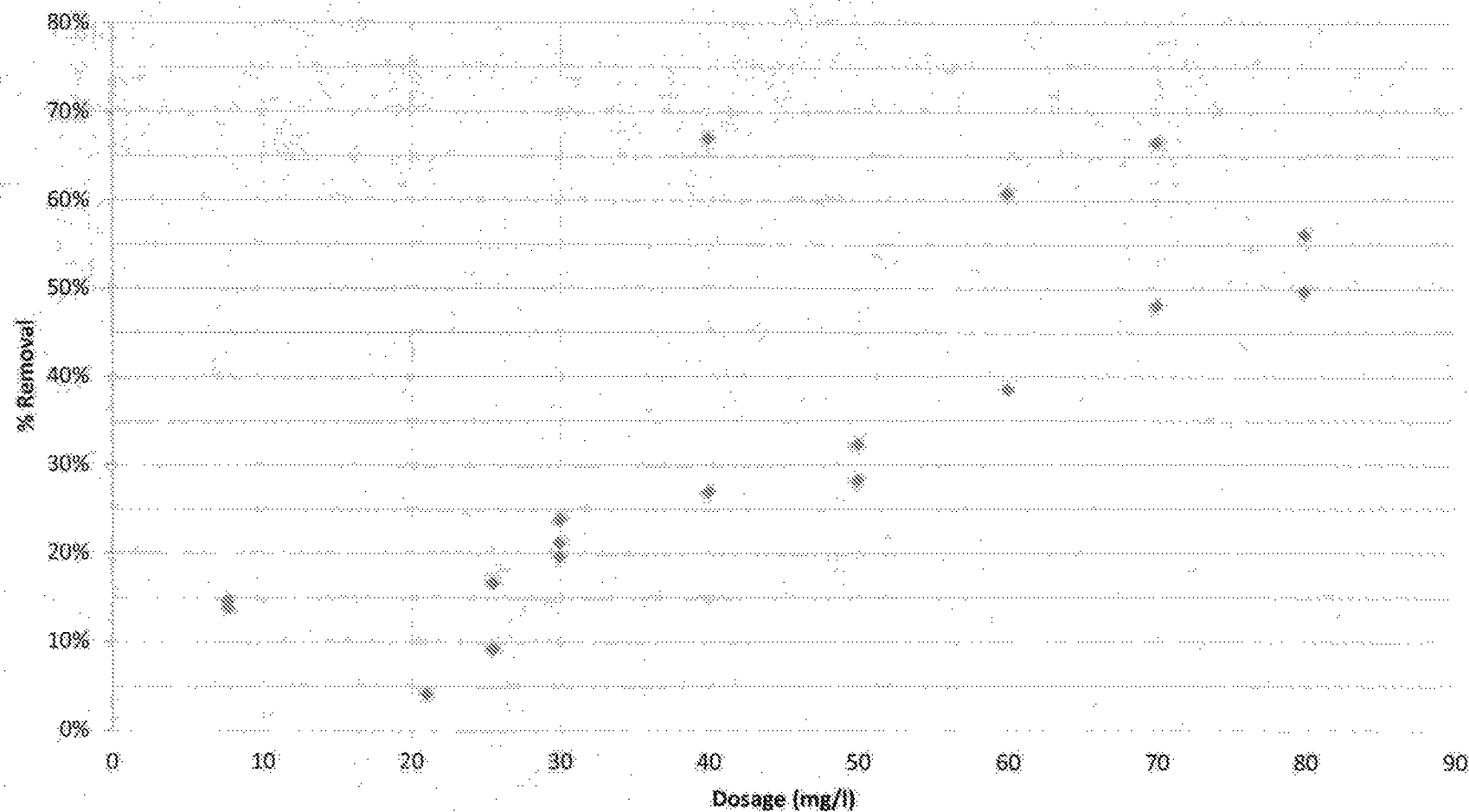




**Len**

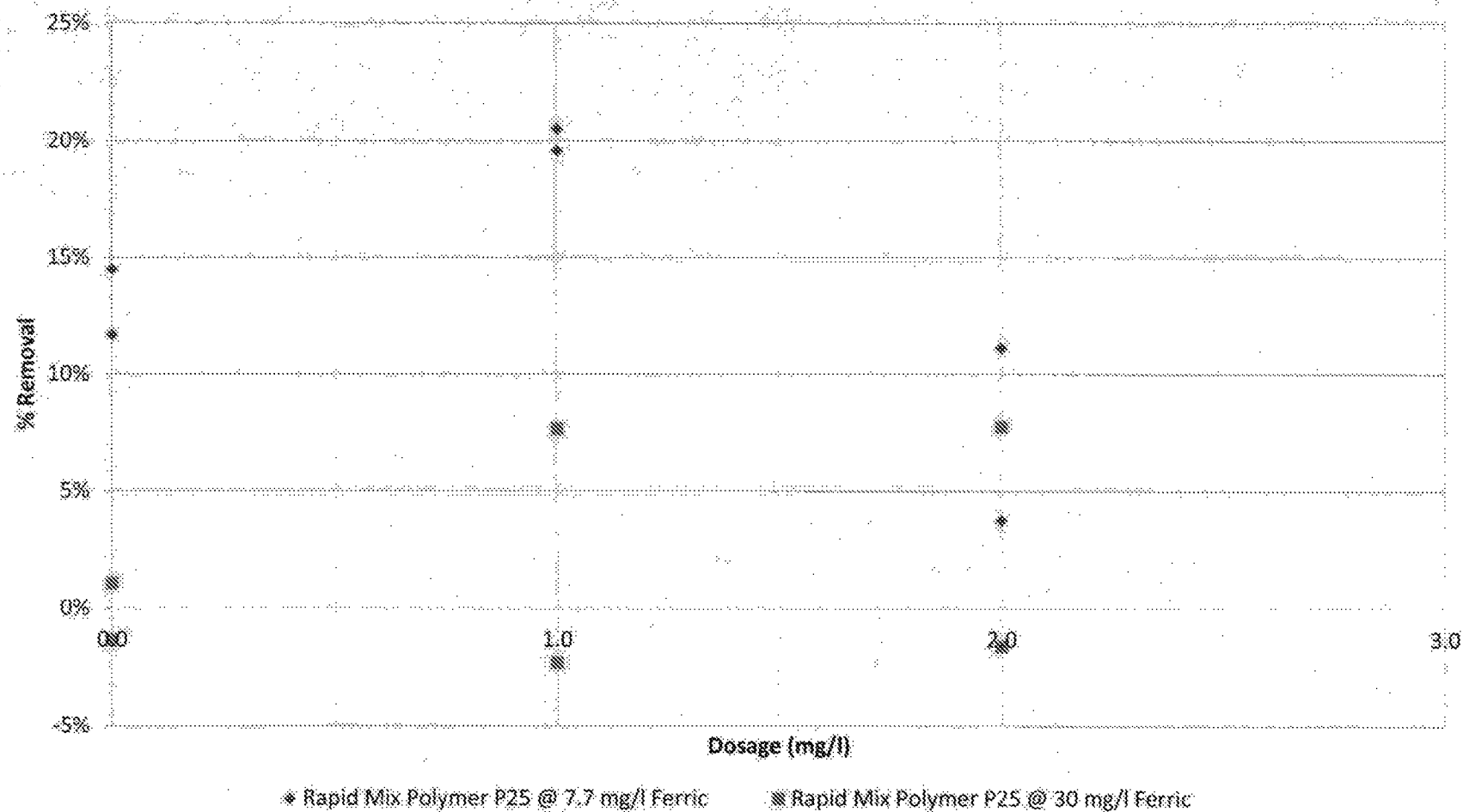
Water Treatment  
Systems & Equipment, Inc.

## Ferric Chloride Feed THM Removal





## Coag/Floc Polymer Aid THM Removal



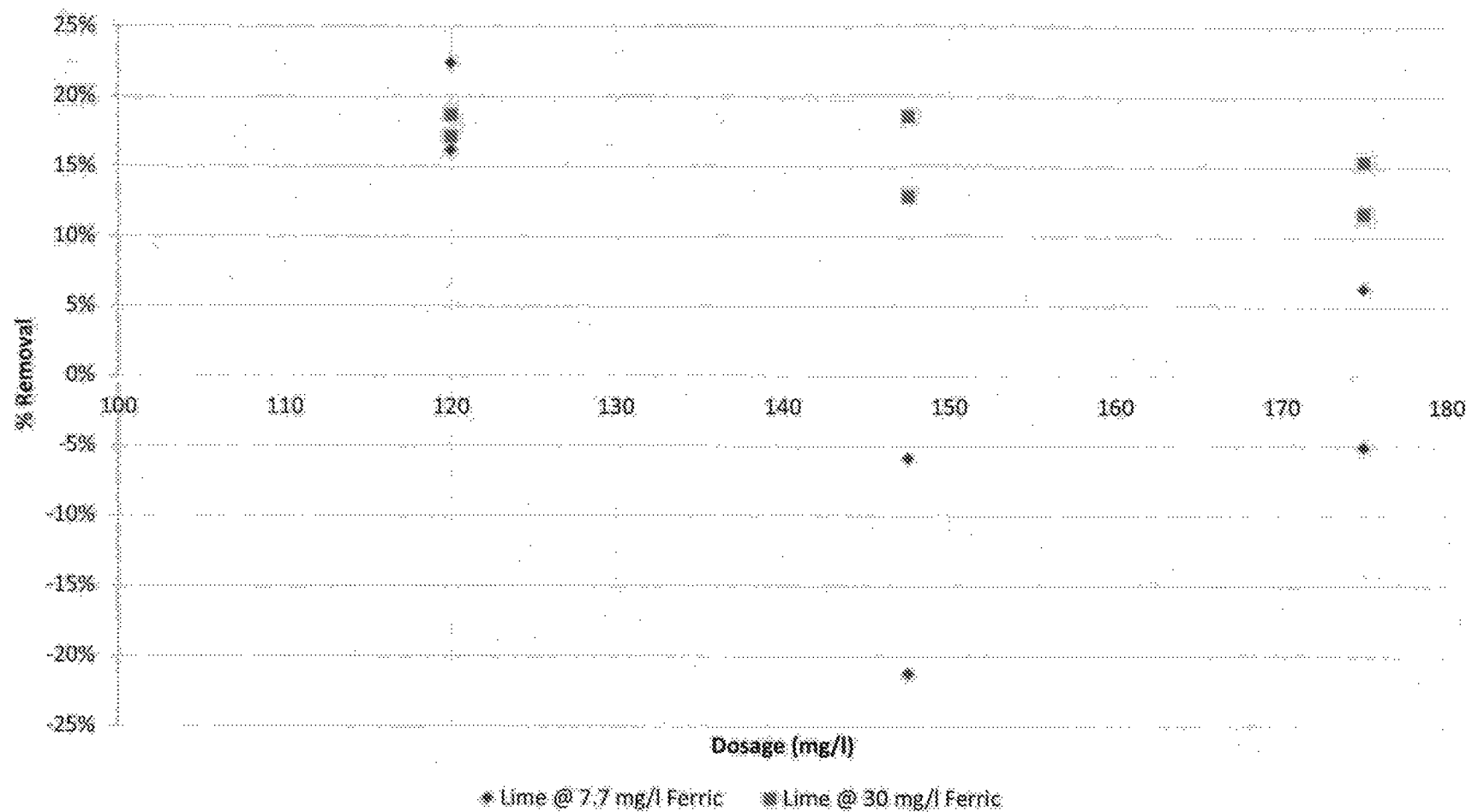


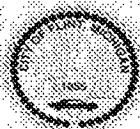


**Len** Environmental Solutions  
Water Treatment Division

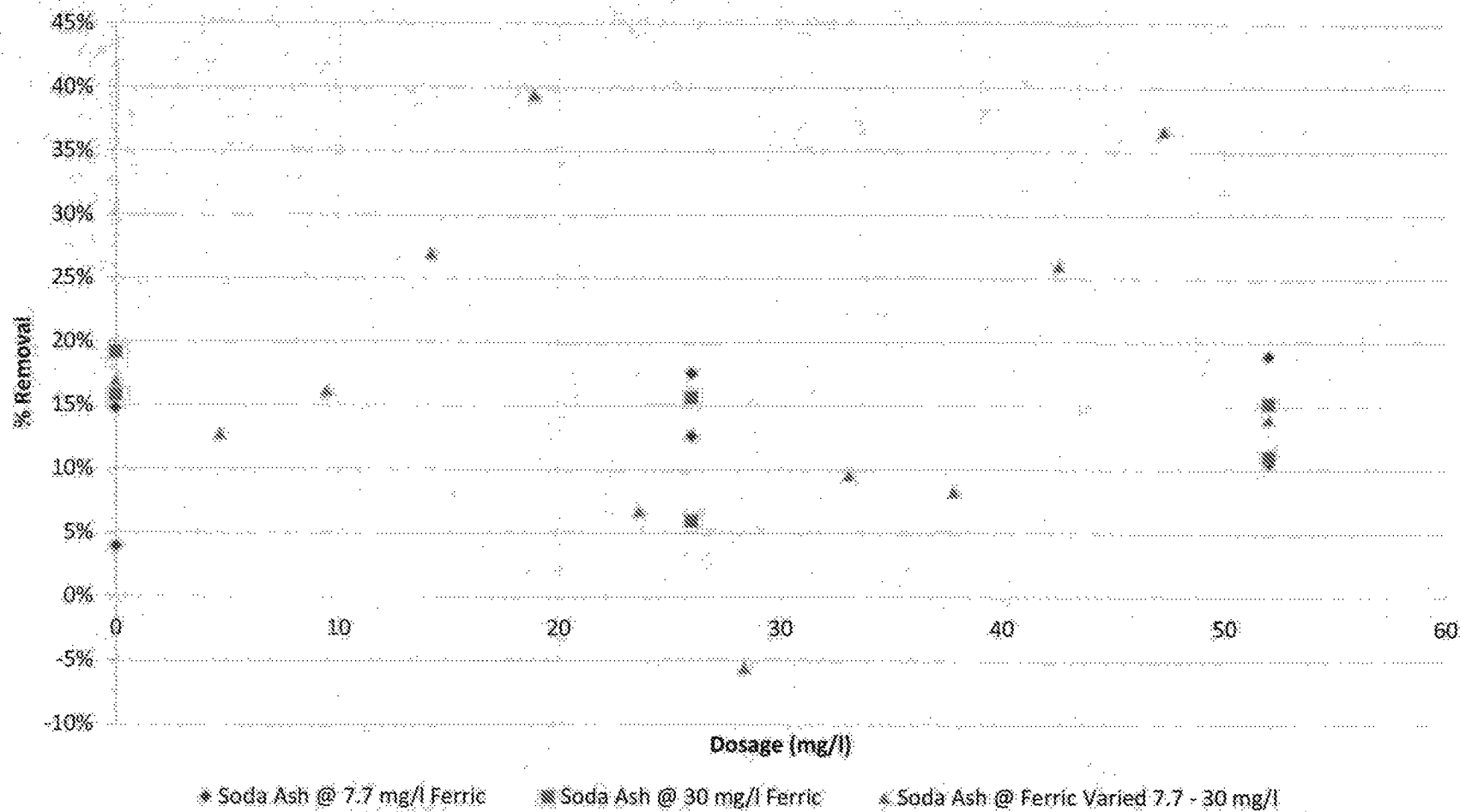
Water Treatment Division  
Lime Feed

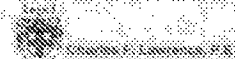
## Lime Feed THM Removal



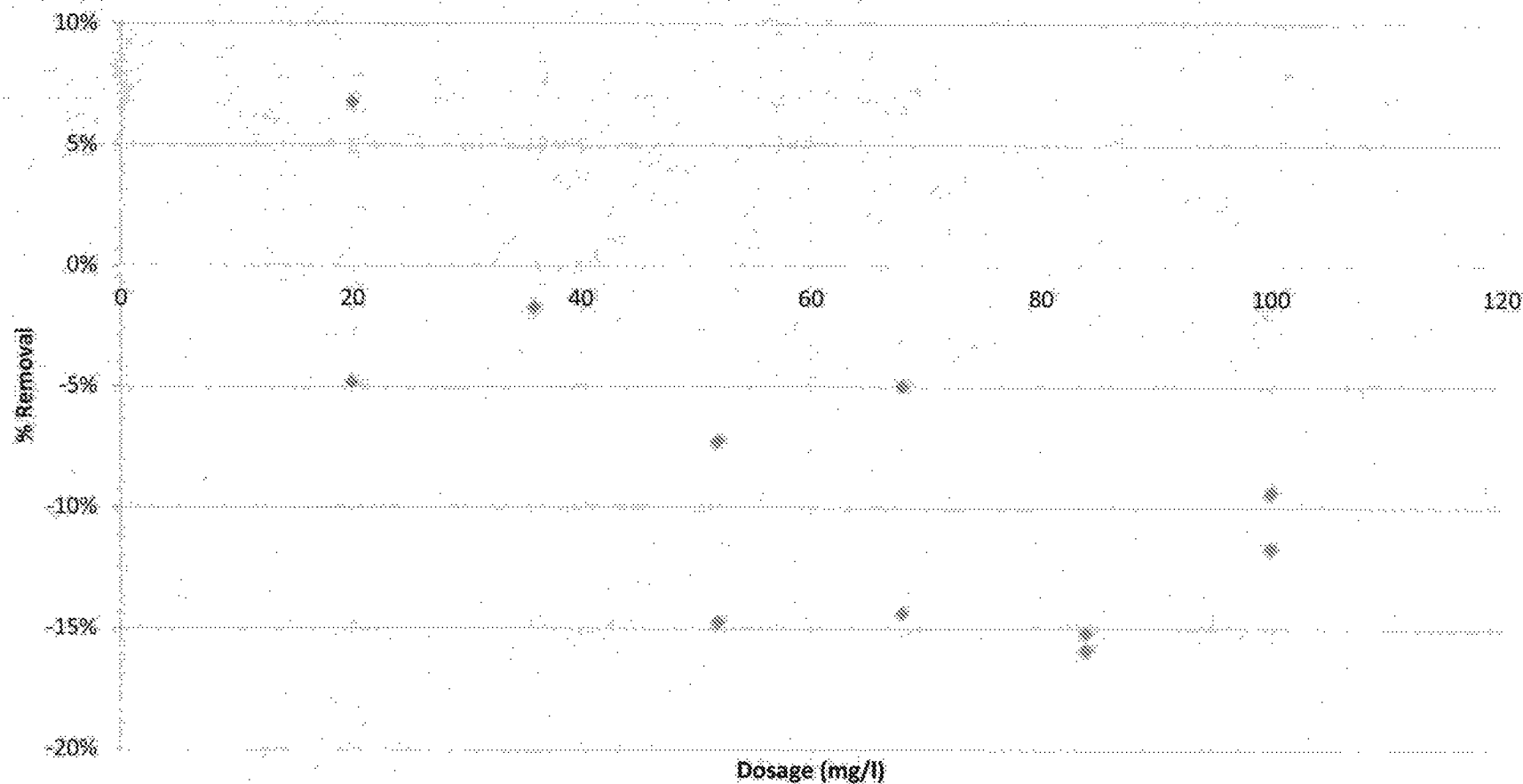


## Soda Ash Feed THM Removal





## PAC Feed THM Removal











## APPENDIX B WTP DATA

TABLE 1 - SUMMARY OF NEGATIVE INFLUENCES ON THM COMPLIANCE SAMPLING

| FACTOR                                                     | 2014 |      |      |     |      |     |     |     |  | 2015 |     |
|------------------------------------------------------------|------|------|------|-----|------|-----|-----|-----|--|------|-----|
|                                                            | May  | June | July | Aug | Sept | Oct | Nov | Dec |  | Jan  | Feb |
| Softening bypass stream over 20% of plant flow             |      |      |      |     |      |     |     |     |  |      |     |
| Ozone system not feeding optimally                         |      |      |      |     |      |     |     |     |  |      |     |
| Using full water storage capacity of WSR & CSR             |      |      |      |     |      |     |     |     |  |      |     |
| Chlorine feed at WTP 7.0 mg/l or more                      |      |      |      |     |      |     |     |     |  |      |     |
| Ferric chloride feed rate less than 10 mg/l Fe3+           |      |      |      |     |      |     |     |     |  |      |     |
| Raw water temp 23 degrees C or more                        |      |      |      |     |      |     |     |     |  |      |     |
| Raw water TOC levels above 8.0 mg/l                        |      |      |      |     |      |     |     |     |  |      |     |
| Raw water coliform over 5000 counts/day                    |      |      |      |     |      |     |     |     |  |      |     |
| Positive bacteria test in dist. system (boil water notice) |      |      |      |     |      |     |     |     |  |      |     |
| Water demand less than 15 mgd                              |      |      |      |     |      |     |     |     |  |      |     |

-  Dates of occurrence
-  Dates of occurrence and expected to repeat in future years
-  Compliance sampling date
-  Factors under Flint staff control
-  Flint River characteristics
-  System factors

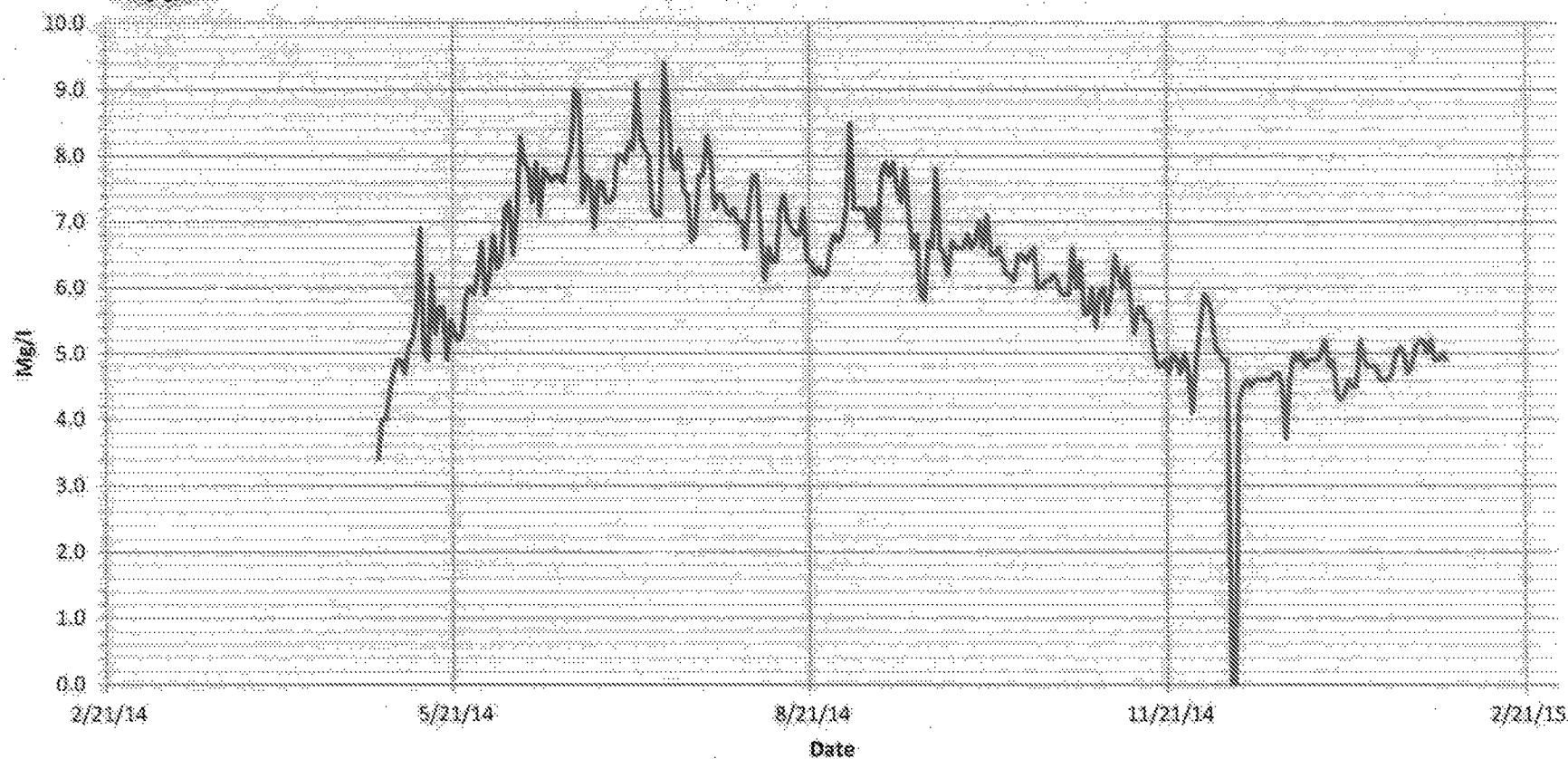


Lockwood, Andrews  
& Newnam, Inc.  
A LEO A DALY COMPANY

DESIGN  
ENGINEERING  
PROGRAM MANAGEMENT

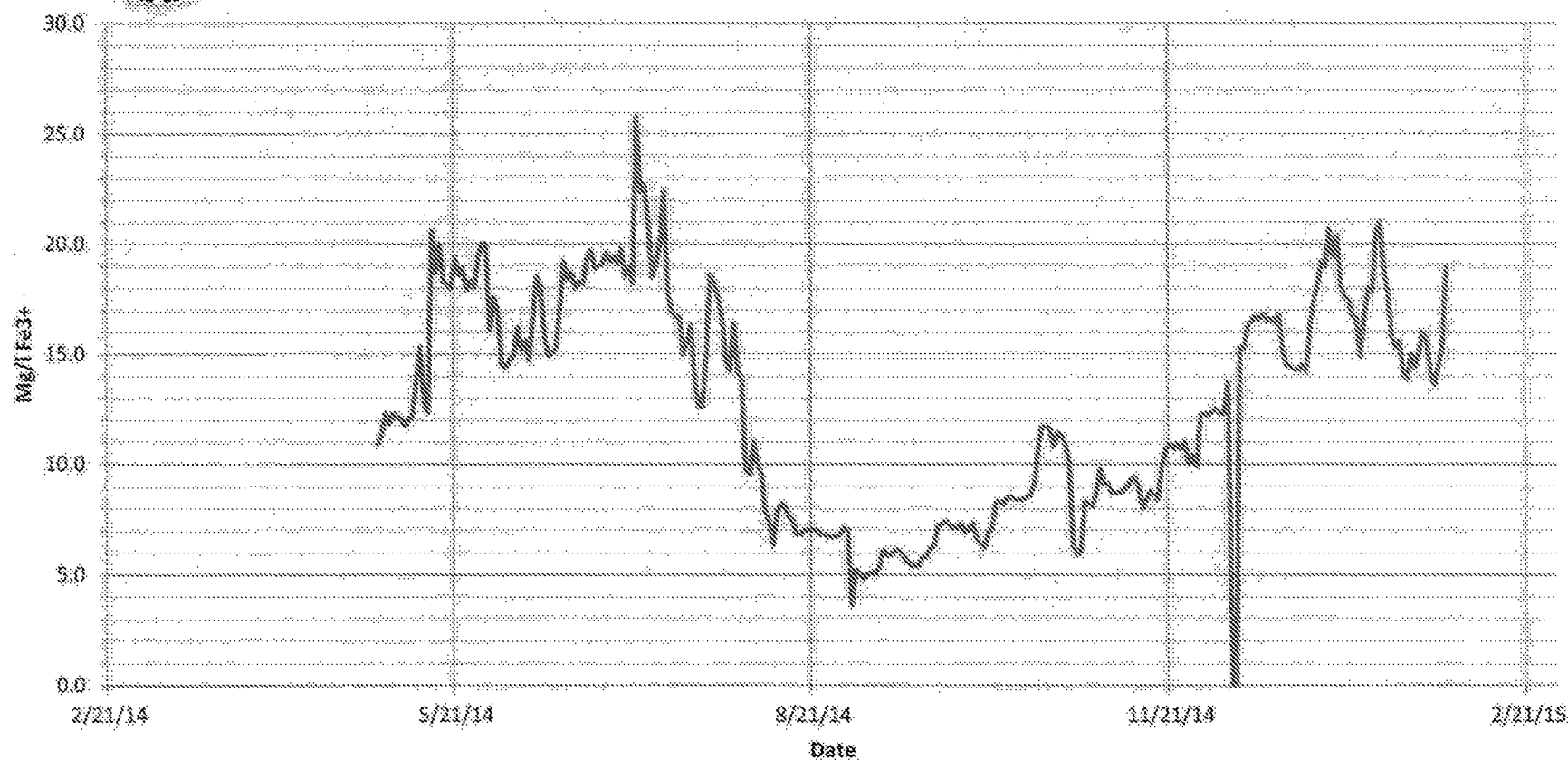


## 2014 Chlorine Feed



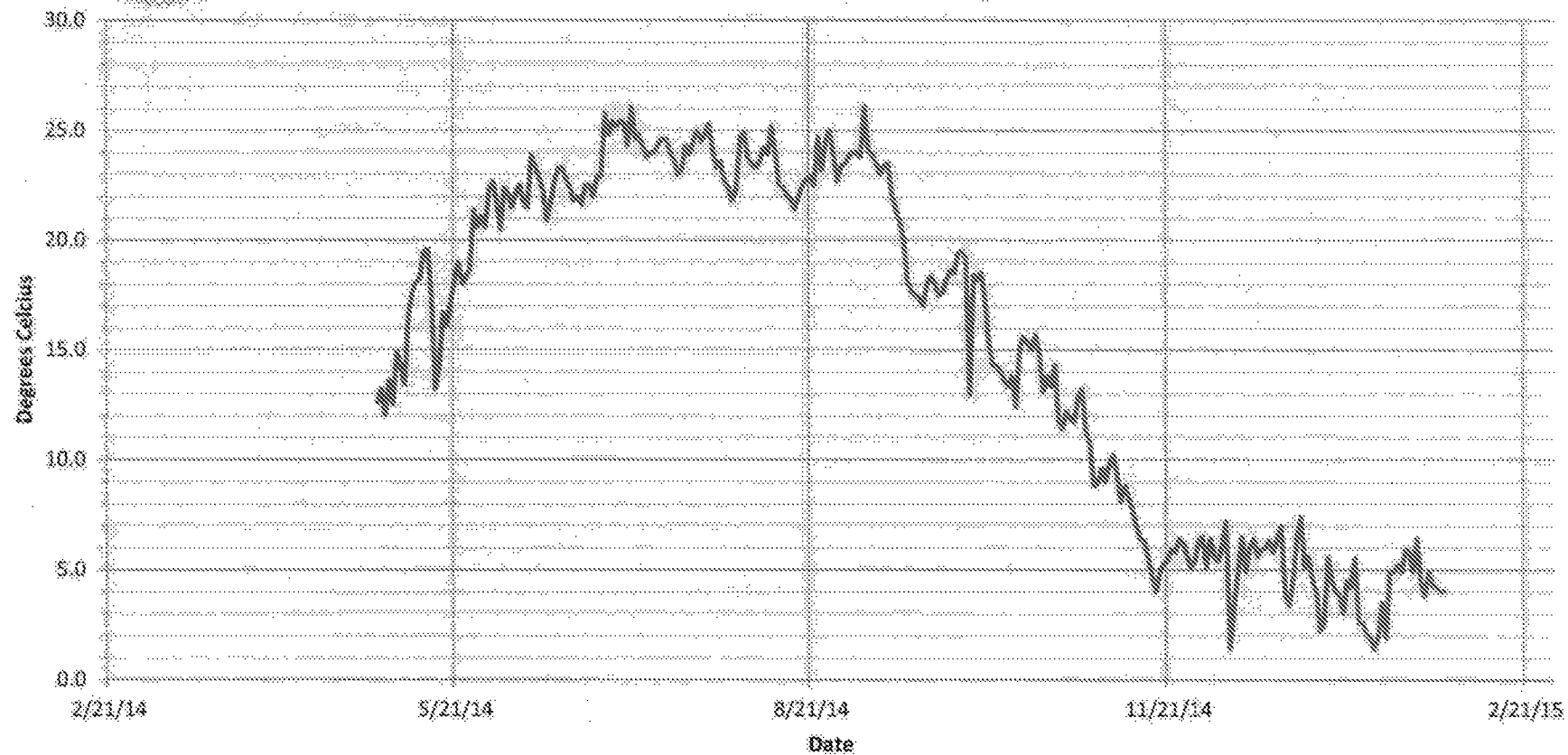


## 2014 Ferric Chloride Dosage





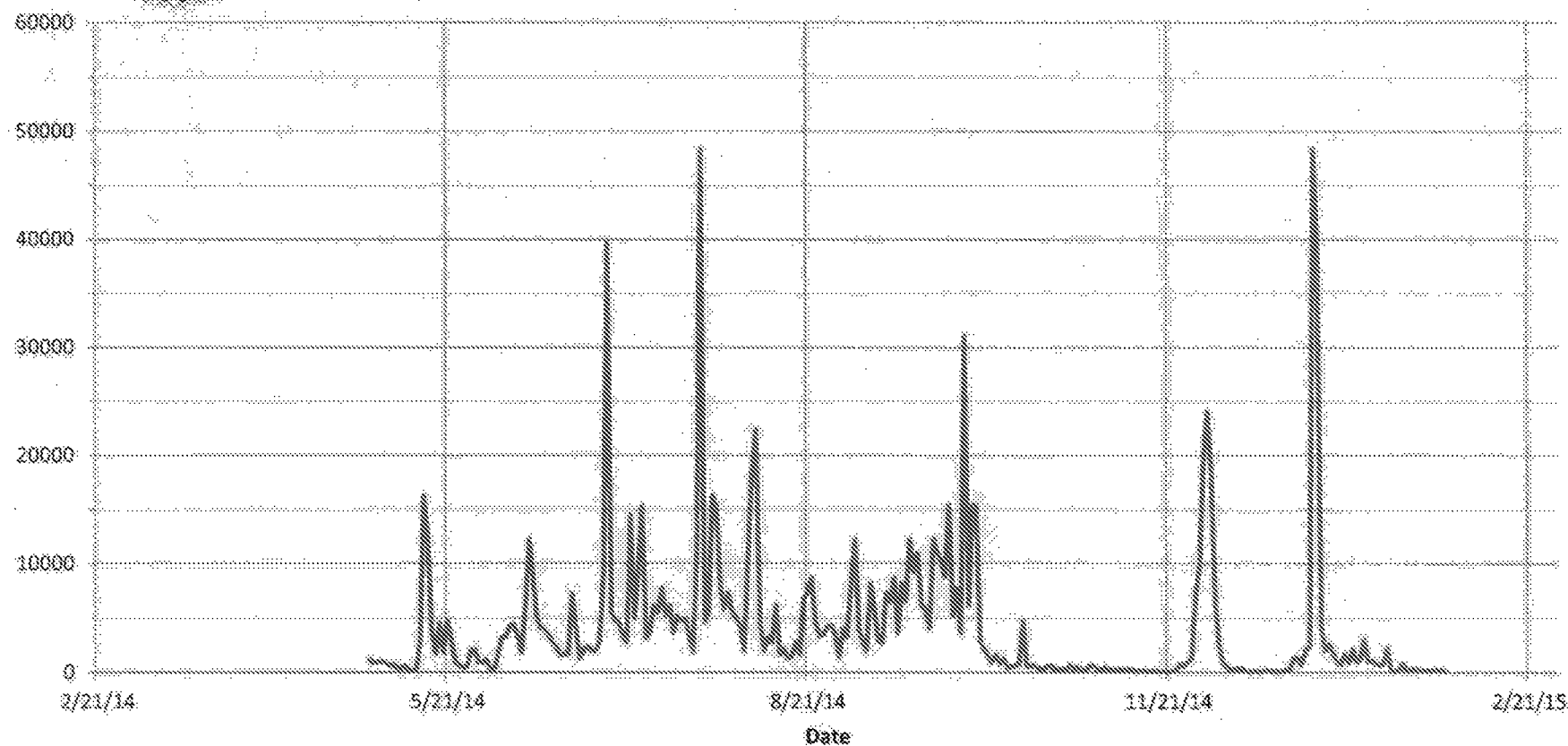
## 2014 Raw Water Temperature

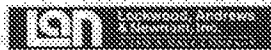




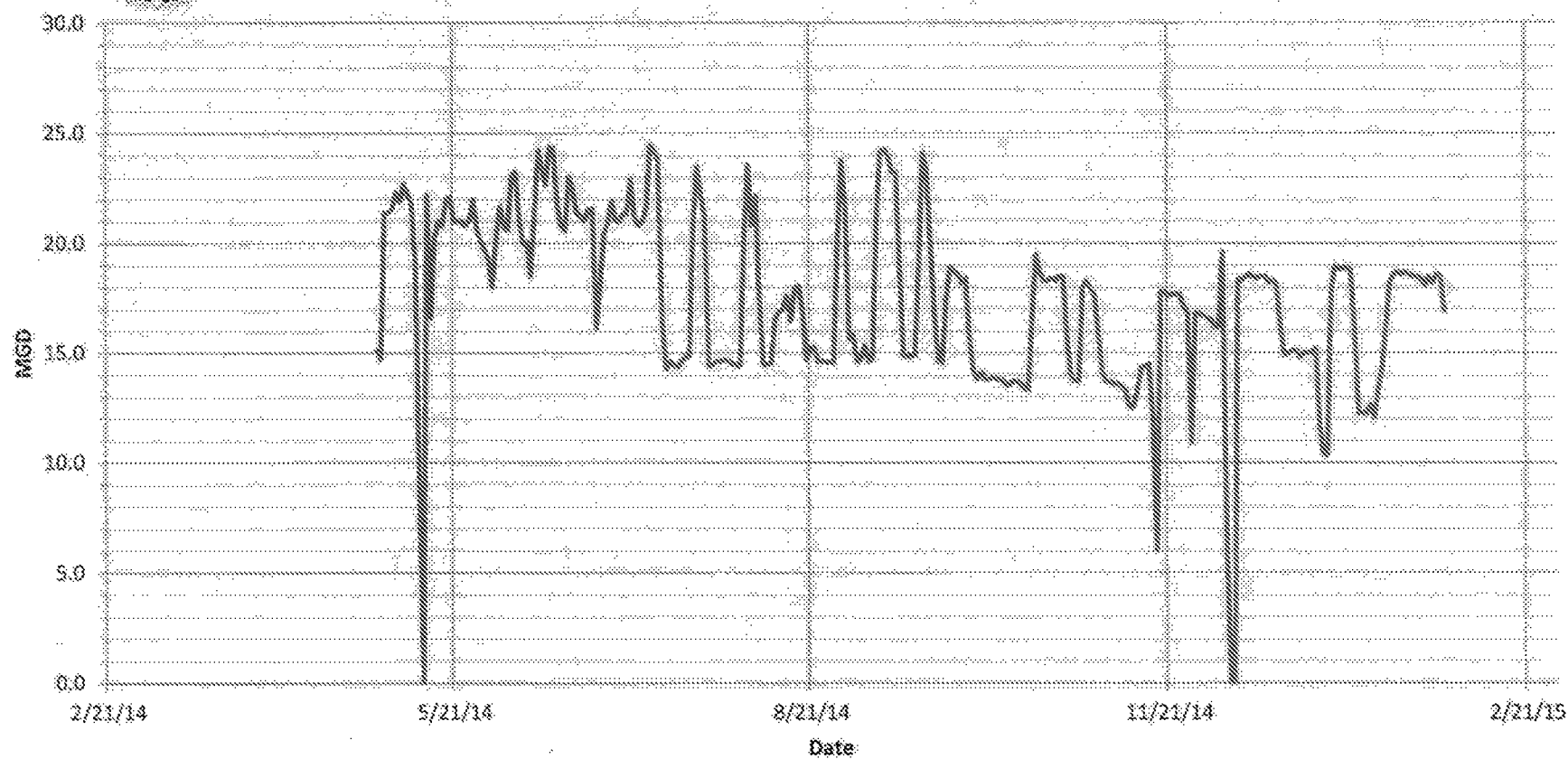


## 2014 Raw Water Coliform Count





## 2014 Daily Water Treated



## **Flint Water FY 2016 Supplemental Budget Request**

### **1. \$1 Million for Filters**

The \$1 million for filters will be used to purchase filters for households in Flint that do not qualify for assistance under any of the DHHS assistance programs. Filters for those residents will be paid for out of funding already in place in DHHS' budget. Each filter is \$20 and they were ordered in bulk through Home Depot. Filters are being distributed through local public health departments, with documentation filed for each filter handed out.

### **2. \$6 Million for switch from Flint River to DWSD**

The City of Flint estimates it will cost the City an additional \$1.3 million per month to use DWSD instead of the Flint River. The State and the City agreed to split the cost through June 2016, when the new Karegnondi Water Authority will be completed and Flint will switch to that water source. (\$1.3 million for 9 months)

### **3. \$1.35 Million for resources to do community Lead Exposure Testing**

DEQ, DHHS and LARA are assembling a team to go into schools, childcare facilities, and other high lead exposure health risk locations to test and follow up on lead exposure.

### **4. \$1 Million for evaluating sample results at the State Lab**

The new testing protocols for schools will require each faucet in the school to be tested and evaluated at the State lab. In addition, lead exposure testing in homes will result in tens of thousands more samples that will be need to processed. Each sample costs \$26 to process.

**Total Ask: \$9.35 Million, \$7.15 GF**

April 15, 2013

Karengondi Water Authority  
4160 Beecher Rd.  
Flint, Michigan 48532-2617

Ed Kurtz, Emergency Manager  
City of Flint  
1101 South Saginaw Street  
Flint, Michigan

Gentlemen:

Over the last several months, governed by a process laid out by the State of Michigan, the Detroit Water and Sewerage Department (DWSD) has proposed a number of alternatives for long term water supply to the City of Flint. Each alternative was offered in the spirit of working in earnest to address the needs, priorities and concerns of the City of Flint and each provided an immediate cost reduction when compared to the current costs of water purchased from DWSD. In the final analysis conducted by Flint, these proposals did not overcome the desire for the Flint/Genesee region to be served by the same system and to have a voice in the future decisions governing the provision of water to this region.

Many of the proposals DWSD has made to Flint during this period are applicable to Flint/Genesee County or KWA with adjustments to demand and use requirements and would provide similar overall benefit. These options remain available for further discussion should the parties' desire. These prior proposals are included in summary form in Attachment 1 as an expanded table 6-1 from the February 2013 State of Michigan Contract No. 271N3200089, City of Flint Water Supply Assessment, submitted by Tucker, Young, Jackson, Tull, Inc. For comparison purposes only, DWSD's new proposal (Flint's 30% allocated share) is inserted.

The proposal scenarios outlined today offer a public/public partnership with options tailored to Flint/Genesee County or KWAs interests. For ease of writing, the remainder of this memo will present this proposal to KWA. Two basic scenarios are presented for consideration, both of which contemplate that KWA would enter a multi-year contract. Service commitments and usage definitions would be negotiated in the same manner as employed that have resulted in new contracts for other customers.

In brief, the proposal provides a unique opportunity to reserve capacity at DWSD's Lake Huron Water Treatment Plant and to participate in decision making for facility operation and capital investment through a joint operating committee. The proposal envisions that KWA would enter into a 30-year contract to purchase treated water directly onsite at DWSD's Lake Huron Water Treatment Plant.

In Scenario 1 the purchased water can either be pressurized or unpressurized. This first scenario results in a "supply only" rate schedule, with a "standby delivery" component to provide for emergency service at the existing Baxter / Potter connection. This scenario provides KWA the ability to construct new transmission owned and operated by KWA.

Scenario 2 maintains the public/public partnership concept and extends it to transmission facilities through which the Lake Huron Water Treatment Plant provides water. This scenario results in a "full service" rate schedule. The standby delivery component is eliminated, since the rate structure to KWA includes costs associated with the transmission system between the Lake Huron Water Plant and the Baxter / Potter connection.

DWSD proposes a modified rate schedule for the customers currently served through the contract with the City of Flint, which includes Flint and Genesee County. This modified schedule is intended to facilitate negotiations for a new water service agreement with the Karegnondi Water Authority (KWA). The scenarios presented herein represent the innovative thinking that DWSD and its new leadership are bringing to the table. Our goal is to provide the lowest cost water solution for the KWA service area.

The potential rate structures are introduced in summary form herein, with preliminary calculations using the proposed rate structures with FY 2013-14 as a baseline. These calculations and the accompanying discussion are based on the assumptions regarding contract terms that approximate recent discussions amongst the parties.

The proposal introduces the concepts, but does not definitively present all of the specifics, appreciating that such specifics are best addressed through negotiations designed to produce a new contractual agreement satisfactory to all parties.

*[Remainder of page intentionally left blank]*

### Scenario 1 – Lake Huron Direct Supply Purchase:

- KWA enters into a long term partnering arrangement with DWSD to purchase all of its primary water supply directly at the DWSD Lake Huron water treatment plant.
- Supply rate schedule is designed to recover only water treatment revenue requirements. This rate schedule does not contain any delivery costs (pumping, transmission, storage, etc.).
- Supply rate schedule is computed based on specific costs associated with the Lake Huron Plant. No other DWSD revenue requirements, including those associated with other DWSD water plants, are included in the rate to KWA.
- Revenue requirements are separated into capital recovery and operation and maintenance expense elements. Baseline revenue requirement data (including operating budget, rate of return, depreciation assumptions, etc.) are identical to those developed for all other wholesale customers.
- KWA is allocated Lake Huron Plant capital revenue requirements based on the proportion of their contracted max day demand (assumed in these calculations at 40.6 mgd) relative to the total capacity at the Lake Huron Plant (400 mgd). The resulting revenue requirements are recovered through a fixed monthly charge.
- KWA is allocated Lake Huron Plant operating revenue requirements based on the proportion of their contracted average daily usage (assumed in these calculations at 24 mgd) relative to the total average daily usage at the Lake Huron Plant (assumed at 125 mgd in these calculations).
- Calculations are conducted for two alternatives. Purchase of *pressurized* water (after high lift pumping) and *unpressurized* water (KWA takes directly from clearwell.)
- Contract includes an arrangement for emergency service at the existing Baxter / Potter connection, and computes a standby charge related to such service.
- The standby charge is computed in the manner set for the by the American Water Works Association (AWWA) in its Manual of Water Supply Practices M1 - "Principles of Water Rates, Fees, and Charges" Manual M1.
  - KWA is allocated one day's worth of transmission related capital revenue requirements.

### Scenario 2 – "Full Service" Lake Huron System

- Same as the "pressurized" option in Scenario 1, except that concept is extended to the pumping, storage, and transmission facilities directly served by the Lake Huron Plant
- Transmission rate schedule is computed based on specific costs associated with these facilities. No other DWSD revenue requirements, including those associated with other DWSD transmission mains, etc, are included in the rate to KWA.
- Revenue requirements are separated into capital recovery and operation and maintenance expense elements. Baseline revenue requirement data (including operating budget, rate of return, depreciation assumptions, etc.) are identical to those developed for all other wholesale customers.
- KWA is allocated Lake Huron "transmission system" capital revenue requirements based on the proportion of their contracted max day demand (assumed in these calculations at 40.6 mgd) relative to the total capacity at the Lake Huron Plant (400 mgd). The resulting revenue requirements are recovered through a fixed monthly charge.

- KWA is allocated Lake Huron "transmission system" operating revenue requirements based on the proportion of their contracted average daily usage (assumed in these calculations at 24 mgd) relative to the total average daily usage at the Lake Huron Plant (assumed at 125 mgd in these calculations).
- Standby charge is eliminated.

The resulting potential proposed rate structures under both Scenarios are summarized below.

Potential Proposed DWSD Water Rate to KWA  
Lake Huron Direct Scenario

|                                         | 1 - Supply Rate @ LH Plant |                    | 2 - Full Service      |
|-----------------------------------------|----------------------------|--------------------|-----------------------|
|                                         | <u>Unpressurized</u>       | <u>Pressurized</u> | <u>Wholesale Rate</u> |
| <u>Supply Rate</u>                      |                            |                    |                       |
| Fixed Monthly Capital Charge - \$       | 219,900                    | 316,600            | 503,200               |
| Commodity Rate - \$/Mcf                 | 2.60                       | 4.16               | 5.31                  |
| <i>Average Unit Cost - \$/Mcf</i>       | <i>4.85</i>                | <i>7.40</i>        | <i>10.46</i>          |
| Monthly Standby Charge                  | 167,500                    | 110,300            | 0                     |
| Total Monthly Charge                    | 387,400                    | 426,900            | 503,200               |
| <i>Total Average Unit Cost - \$/Mcf</i> | <i>6.57</i>                | <i>8.53</i>        | <i>10.46</i>          |

The direct comparison over the period 2013-2042 is demonstrated in Attachment 2.

As KWA considers this proposal, I offer the following observations for consideration:

- The Public Partnership requires the least near term capital investment and preserves the economy of scale associated with operation of a large regional system resulting in an immediate reduction in the cost of water supply for Flint/Genesee, making the identified and necessary near term investment in local water infrastructure more feasible.
- The Public Partnership provides the opportunity to optimize service level and efficiency through collaborative asset management decision making.
- The Public Partnership provides representation for critical decision making consistent with DWSD newly demonstrated interest in engaging our customers in critical decisions impacting them. This formalizes that interest in contractual terms.
- The Public Partnership reduces the risks identified with a 'go alone' solution, including further declines in use/sales (see graph), project cost overruns or schedule delays and other unforeseen costs inherent in starting a new venture. See Attachment 3
- The DWSD Board of Commissioners has previously approved sale of raw water from the Lake Huron facilities for raw water end use. We remain open to further discussion about the raw water capacity needs and stand ready to provide an affordable commodity option.



DWSD is an organization in transformation. In April of 2011, a new Board of Commissioners was seated with additional autonomy and more direct customer representation. In the past year we have demonstrated the ability to reduce costs, resolve long standing compliance issues and have gained support for establishing a new legal and operational model for DWSD that could enable broadened representation for Flint/Genesee on the Governing Board.

I remain available to discuss this proposal to assure that each of the issues critical to Flint/Genesee are addressed.

Best regards,

*Sue McCormick*

Sue McCormick, Director  
Detroit Water and Sewerage Department

Cc: Andy Dillon, State Treasurer  
Dayne Walling, Mayor – City of Flint  
Kevyn Orr, City of Detroit Emergency Financial Manager  
Jeff Wright, Genesee County Drain Commissioner  
James Fausone, Chair – Detroit Board of Water Commissioners



# Attachment 1

## DWSD Water Supply Costs Estimates to Flint

| <u>Option</u>                                            | Water<br>Supply<br>Costs (\$)<br><u>through</u><br><u>2042</u> | Ranking<br>by<br><u>Cost</u> |
|----------------------------------------------------------|----------------------------------------------------------------|------------------------------|
| <b>DWSD 4/15/2013 Scenario 2</b>                         | 587,990,650                                                    | 1                            |
| <i>DWSD 8 MGD Max Day @ Imlay</i>                        | 634,795,488                                                    | 2                            |
| <i>KWA (10/31/12 No Overruns, As Provided) *</i>         | 649,775,166                                                    | 3                            |
| <i>DWSD 8 MGD Max Day @ Baxter / Potter</i>              | 672,671,705                                                    | 4                            |
| <i>KWA-1 (10/31/12 No Overruns with Financing Costs)</i> | 707,279,715                                                    | 5                            |
| <i>DWSD 12 MGD Max Day @ Imlay</i>                       | 725,576,803                                                    | 6                            |
| <i>DWSD 12 MGD Max Day @ Baxter / Potter</i>             | 762,110,308                                                    | 7                            |
| <i>KWA-2 (Treasury Estimate)</i>                         | 766,784,313                                                    | 8                            |
| <b>DWSD 12 mgd Twin Line Proposal / No blending</b>      | 818,092,150                                                    | 9                            |
| <i>DWSD 18 MGD Max Day @ Baxter / Potter</i>             | 821,226,268                                                    | 10                           |

### Italicized Options as presented in TYJT Report

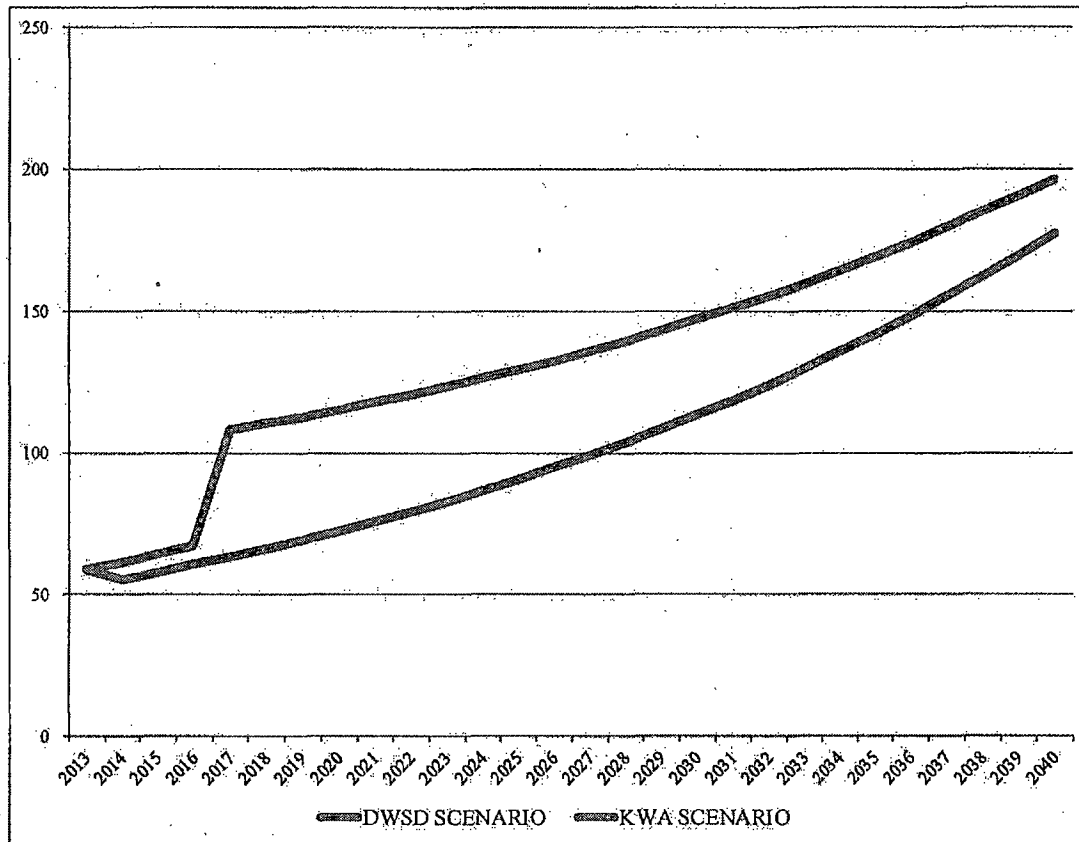
## DWSD Water Supply Costs Estimates to Flint / GCDC \$ millions

| <u>Option</u>                    | All Water<br>Costs (\$)<br><u>through</u><br><u>2042</u> | Ranking<br>by<br><u>Cost</u> |
|----------------------------------|----------------------------------------------------------|------------------------------|
| <b>DWSD 4/15/2013 Scenario 2</b> | 3,282.00                                                 | 1                            |
| <b>Estimate of KWA</b>           | 4,090.06                                                 | 2                            |



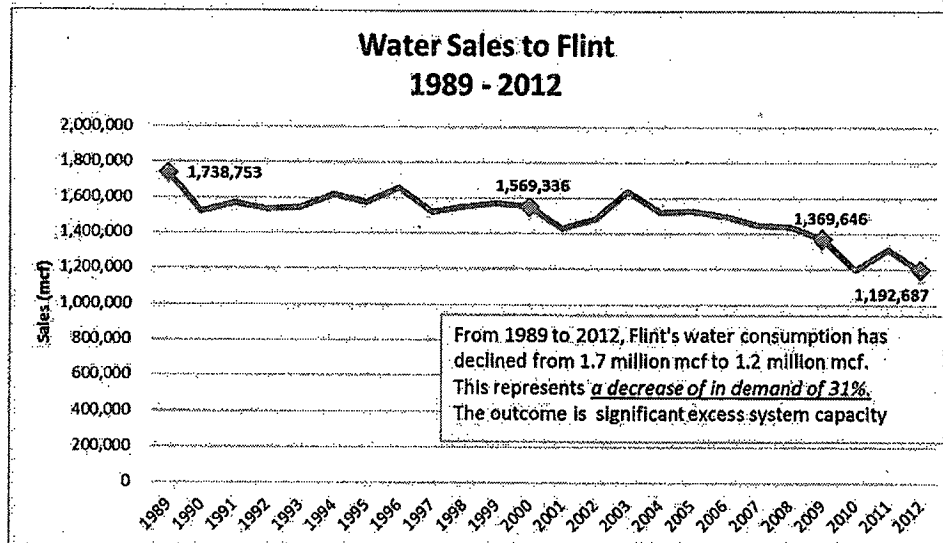
## Attachment 2

SUMMARY OF **TOTAL** PROJECTED WATER COSTS TO FLINT/GCDC - SCENARIO COMPARISON (\$ millions)





## Attachment 3





RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



DAN WYANT  
DIRECTOR

June 9, 2015

Mr. Brent Wright, Operations Supervisor  
City Of Flint – Department of Public Works  
Flint Water Plant  
4500 North Dort Highway  
Flint, Michigan 48505

WSSN: 02310

Dear Mr. Wright:

SUBJECT: Violation Notice (VN) – Maximum Contaminant Level for Total  
Trihalomethanes (TTHM)  
2nd Quarter 2015 Monitoring Period

The Department of Environmental Quality (DEQ), Office of Drinking Water and Municipal Assistance (ODWMA), records show that the city of Flint (City) is in violation of the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399); R 325.10610, *Maximum contaminant levels for disinfection byproducts (MCLs)*, of the 1979 Administrative Code.

In accordance with R 325.10610, *MCLs*, of the 1979 Administrative Code, the MCL for disinfection byproduct TTHM is 0.080 milligrams per liter (mg/L) as a Locational Running Annual Average (LRAA) at each monitoring location. As listed in the table below, our records show that the City's highest TTHM LRAA, based on the last four quarters, ending June 30, 2015, is 0.094 mg/L which exceeds the standard, and at this time only one of the eight sample site locations exceed the LRAA standard of 0.080 mg/L.

Our investigation consisted of a review of ODWMA files for laboratory reports received for compliance monitoring. Our investigation is considered complete. This violation began on June 1, 2015, and will continue until the TTHM LRAA is below the MCL at all sample sites.

| TTHM Results (mg/L)                             |              |              |         |         |              |       |
|-------------------------------------------------|--------------|--------------|---------|---------|--------------|-------|
|                                                 | 8/21/14      | 11/20/14     | 2/17/15 | 5/18/15 | LRAA         | OEL   |
| DBP1 McDonalds<br>3719 Davison                  | <b>0.145</b> | 0.059        | 0.0162  | 0.0514  | 0.068        | 0.044 |
| DBP2 Liquor Palace<br>3302 South Dort Highway   | <b>0.127</b> | 0.033        | 0.0168  | 0.0635  | 0.060        | 0.044 |
| DBP3 North Flint Auto<br>6204 North Saginaw St. | <b>0.118</b> | 0.041        | 0.0149  | 0.0452  | 0.055        | 0.037 |
| DBP4 University Market<br>2501 Flushing Road    | <b>0.196</b> | <b>0.094</b> | 0.0245  | 0.0598  | <b>0.094</b> | 0.059 |
| DBP5 Taco Bell<br>3606 Corunna Road             | <b>0.181</b> | 0.034        | 0.0151  | 0.0547  | 0.072        | 0.040 |
| DBP6 Rite-Aid Pharmacy<br>5018 Clio Road        | <b>0.144</b> | 0.054        | 0.0192  | 0.0605  | 0.069        | 0.048 |
| DBP7 Salem Housing<br>3216 MLK Boulevard        | <b>0.112</b> | 0.050        | 0.0285  | 0.0727  | 0.066        | 0.056 |
| DBP8 BP Gas Station<br>822 South Dort Highway   | <b>0.112</b> | 0.036        | 0.0199  | 0.0461  | 0.054        | 0.037 |

We are encouraged by the results from the most recent round of compliance samples collected on May 18, 2015, which again show individual TTHM levels below 0.080 mg/L at all locations throughout the City's system. Operational Evaluation Reports from December 2014, February 2015, and May 2015, have identified possible causes and corrective measures for the previous elevated TTHM levels which we encourage the City to continue implementing. These modifications have likely contributed in part to the reduction in TTHM levels reported for the most recent quarter in comparison to levels in May 2014, and suggest the City may be able to achieve compliance with the TTHM standard at all sites by continuing these efforts.

Our office is currently reviewing the Operational Evaluation Report dated May 29, 2015, and will provide the City and their consultant with comments, as needed, to help address this MCL violation.

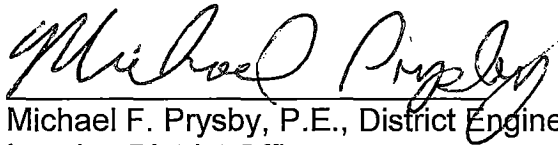
Further, the TTHM operational evaluation level (OEL) calculated in accordance with R 325.10719I, *Disinfection byproducts: operational evaluation levels*, of the 1979 Administrative Code, is now below the 0.080 mg/L operational evaluation trigger at all eight sample site locations. However, our office is requesting that an operational evaluation again be conducted incorporating the most recent sample results, given the increase in TTHM levels from February 2015 results, and that the next monitoring period of August has been identified as the City's peak month for TTHM levels. **Please provide our office with an updated Operational Evaluation Report by Monday, August 31, 2015.**

If you have any other factual information you would like us to consider regarding the violation identified in this VN, please provide them in a written response by June 23, 2015.

Administrative rule R 325.10403 of Act 399 requires that suppliers provide public notice (PN) as soon as practical, but no later than thirty (30) days after the supplier learns of this type of violation, by mail or direct delivery **and** by any other means reasonably calculated to reach customers not normally reached by mail. Enclosed is a sample PN which contains the minimum required language. The City is encouraged to include additional information regarding its response efforts to this violation. **Please notify your consumers by July 1, 2015, and send us a signed and dated copy of the notice that you issued within ten (10) days of distributing the PN.** This violation must also be included in your 2015 Consumer Confidence Report, due by July 1, 2016. The PN must be repeated every quarter until you no longer exceed the TTHM standard. Failure to issue a PN for this violation will result in a fine of at least \$1,000 per event, with a maximum of \$5,000 per violation.

We anticipate and appreciate your continued cooperation in resolving this matter. If you have any questions regarding this VN, please contact us at the numbers below; at prysbym@michigan.gov; or rosenthala@michigan.gov; or at DEQ, P.O. Box 30242, Lansing, Michigan 48909-7742.

Sincerely,



Michael F. Prysby, P.E., District Engineer  
Lansing District Office  
Office of Drinking Water and  
Municipal Assistance  
517-290-8817



Adam Rosenthal, Environmental Quality  
Analyst  
Lansing District Office  
Office of Drinking Water and  
Municipal Assistance  
517-284-6644

Enclosure

cc: Ms. Jennifer Crooks, U.S. Environmental Protection Agency, Region 5  
Mr. Robert Bincsik, City of Flint  
Mr. Howard Croft, City of Flint  
Mr. Michael Glasgow, City of Flint  
Genesee County Health Department  
Ms. Liane Shekter Smith, DEQ  
Mr. Richard Benzie, DEQ  
Mr. Stephen Busch, DEQ

## IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

### City of Flint Did Not Meet Treatment Requirements

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Samples were collected for total trihalomethanes (TTHM) analysis from eight locations on a quarterly basis (August 21, November 20 of 2014, and February 17 & May 18 of 2015). The average of the results at **ANY** of the eight locations must not exceed the maximum contaminant level (MCL) for TTHMs, otherwise our water system exceeds the MCL. The standard for TTHMs is 80 micro grams per liter ( $\mu\text{g/L}$ ). The location reporting the highest TTHM level was 94  $\mu\text{g/L}$ ; thus, our water system exceeds the TTHM MCL.

#### What should I do?

- There is nothing you need to do unless you have a severely compromised immune system, have an infant, or are elderly. These people may be at increased risk and should seek advice about drinking water from their health care providers.
- You do not need to boil your water or take other corrective actions. If a situation arises where the water is no longer safe to drink, you will be notified within 24 hours.

#### What does this mean?

This is not an emergency. If it had been an emergency, you would have been notified within 24 hours.

*People who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer.*

#### What is being done?

We are currently working on solutions to correct the problem. We anticipate resolving the problem in 2015. Our most recent individual sample results were all less than the 80  $\mu\text{g/L}$  standard, however since compliance is calculated using a locational running annual average (LRAA) of the most recent four quarters, we are still out of compliance with the MCL at one of eight locations.

For more information, please contact Mr. Brent Wright at 517-787-6537, or the Flint Water Plant at 4500 North Dort Highway, Flint, Michigan 48505.

*Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by the City of Flint.

---

CERTIFICATION:

WSSN: 02310

I certify that this water supply has fully complied with the public notification requirements in the Michigan Safe Drinking Water Act, 1976 PA 399, as amended, and the administrative rules.

---

Signature

Title

Date Distributed

Reminder to water supplier: This notice/certification must be sent to the Department of Environmental Quality.

**City of Flint Water Supply Assessment  
Tucker, Young, Jackson, Tull Inc.  
February 2013**

**MDEQ – LDO Comments**

1. DWSD's most cost-effective option of 8 MGD maximum day from either the Inlay Station or from FL-1 in Table 6-1 clearly causes the Flint WTP to exceed the 2:1 DWSD – Flint River blending ratio during maximum day demand and the high usage months in the summer. The need to soften during higher usage from the Flint River will increase capital improvement costs and on-going operation/maintenance costs at the Flint WTP.

Additional capital improvement include:

- Repairs to lime slakers and lime storage silos
- Disposal of lime sludge residuals – on site de-watering/filter press system
- Potential for higher Cryptosporidium Bin classification from the Flint River which will require more advanced treatment (UV disinfection, etc).
- Flint WTP is rated at 36 MGD. Existing components (pumps, treatment basins, chemical feed systems) may not be suitable for treating at very low rates (8.0 MGD or less).

Additional operational costs include:

- Additional treatment chemical cost – lime-soda ash for softening
- Additional electrical usage for increased ozone generation and softening
- Additional system monitoring for increased levels of disinfection by-products

The TYJT report does not address these additional costs.

2. The Average Unit Cost of purchased water from DWSD presented in Table 4-2 is misleading since the annual change was based on a hypothetical rate that Flint would be been offered had they signed a new purchase contract with DWSD. The actual annual change (average) of water purchased from DWSD by Flint is approximately 10.5% based on a rate analysis conducted by Flint and their consultant.



3. The TYJT report projects the cost of the pumping stations at \$71 million and is approximately \$40 million higher than KWA's cost estimate. KWA, Flint, and their consultant provide accurate construction costs that would support their cost estimate. We would agree with TYJT's experience of higher construction costs in the immediate Detroit metropolitan area due to local construction costs and requirements; however, these higher are not always applicable in out-state areas.
4. In Table 5-5 TYJT's estimate of \$71 million and \$218 million for the pumping stations and transmission main respectively includes their 30% ELAC estimate. TYJT; however, includes an additional \$32.5 million for further ELAC costs and increases the total ELAC costs to approximately 43%. It appears that the ELAC is being double-counted and a 43% ELAC seems unwarranted for a project having a significant amount of preliminary design engineering completed.
5. Page 19 of the TYJT report states that under the KWA option, two separate treatment process streams would need to be maintained for the Flint River as a back-up supply. This is not true. The Flint WTP could use their existing KWA treatment train to treat Flint River water; however, some of treatment processes would need to be adjusted (increase coagulant and disinfectant dosages).
6. TYJT states on Page 15 that approximately \$7.1 million in capital improvements will be needed at the Flint WTP for the KWA option based on the 2009 KWA preliminary engineering report. A decrease in these costs (KWA option) is likely as some of the capital improvements are not critical in the WTP's operation. However, additional capital improvements are needed if the WTP is utilized as part of DWSD's most cost effective blending option (see Item #1).
7. Page 18 of the TYJT report offers a second pipeline to Flint for redundancy along with sharing the capital cost of the new pipeline by all DWSD customers. How well will other DWSD customers accept this proposition?
8. The DWSD also offers to sell the existing transmission line to Flint for \$4.7 million. What are the O&M costs of the transmission main? These costs do not appear to be included in the cost analysis. Will Flint be able to charge (sell) water to the Lapeer county customers that would then be purchasing water from Flint's pipeline? Finally, the pipeline is 50 year old, what is the remaining life expectancy of the pipeline and is this the best long-term investment for Flint?
9. Page 2 states that the 18 miles of pipeline from KWA to the Flint WTP is a 30-inch diameter main. The KWA Appendix 20 – October 2012 document states the pipeline is a 36-inch diameter main. The city of Flint is also investigating the proper size needed for this pipeline to meet their WTP's rated capacity and will be addressed in the final design.

**10. Page 20 states that due to Flint's high water loss that the KWA pipeline**



# Genesee County Health Department

Mark Valacak, M.P.H., Health Officer  
Gary K. Johnson, M.D., M.P.H., Medical Director

January 27, 2015

FOIA Coordinator, City of Flint  
1101 S. Saginaw Street, 3<sup>rd</sup> floor  
Flint, MI 48502

## **RE: Flint Water Plant Information Request**

Dear FOIA Coordinator,

Under provisions of the Michigan Freedom of Information Act (MCLA 15.231 et seq; MSA 4.1801 (1) et seq) please provide copies of the following:

Provide specific water testing locations and laboratory results within the City of Flint public water system for Coliform, E-coli, Heterotrophic Bacteria and Trihalomethanes from January 1, 2010 to January 27, 2015. Provide any additional water testing that has been conducted for identifying potential public health risks. Include any available mapping of the water testing areas.

Provide a map delineating the boundaries of the City of Flint water distribution system. Include any changes to the boundaries, along with corresponding dates from January 1, 2014 to January 27, 2015.

Provide a map or list of locations, detailing dead ends, pooling, low pressure and any additional areas of concern within the City of Flint water distribution system. Include any modifications to the water distribution system addressing concerns, along with corresponding dates from January 1, 2014 to January 27, 2015.

If you determine that any of the requested information is exempt from disclosure, please detail what is being withheld and cite the exemption under FOIA. I anticipate the request being filled within five working days of receipt of this letter, as provided under FOIA. Please contact me at (810) 257-3618 if there are fees associated to comply with this request.

Sincerely,

**Jim Henry**

Jim Henry  
Environmental Health Supervisor  
Genesee County Health Department  
630 S. Saginaw Street  
Flint, MI 48502

Better Life Through Better Health

Floyd J. McCree Courts & Human Services Building ♦ 630 S. Saginaw Street, Ste. 4 ♦ Flint, Michigan 48502-1540

Burton Branch ♦ G-3373 S. Saginaw Street ♦ Burton, Michigan 48529

Main Phone 810-257-3612 ♦ Visit us at: [www.gchd.us](http://www.gchd.us)

**Prysby, Mike (DEQ)**

---

**From:** Benzie, Richard (DEQ)  
**Sent:** Wednesday, March 11, 2015 7:33 PM  
**To:** Shekter Smith, Liane (DEQ)  
**Cc:** Busch, Stephen (DEQ); Prysby, Mike (DEQ)  
**Subject:** RE: Information Request and Documentation

Liane,

Steve's initial response is below.

As I see it, we need a plan of action fast.

- 1) Inform DEQ management, including legislative and media liaisons; suggest additional communication with DCH
- 2) Prepare response to Genesee County email – did anyone in ODWMA or DEQ have any contact with Genesee County about Legionella and if so, when and what? Was anyone in ODWMA or DEQ requested to meet with Genesee County to discuss Legionella and if so, when, and did they “decline” to meet?
- 3) Contact Flint to alert them of County's concerns and determine their response to the January 27<sup>th</sup> FOIA request.
- 4) Arrange for a meeting with Genesee County and other parties as deemed appropriate by DEQ management – DCH, Flint, Governor's Office, etc.; Establish a “Lead” agency but also develop a team approach to move forward and determine an appropriate, common message as well as when such information should be shared and by whom. Determine how long has Genesee County, DCH, and Flint been aware of the increased cases of Legionella and what the message should be about delays in public notification.
- 5) Determine additional steps – possible monitoring protocols, premise plumbing treatment options, public precautions if any, etc.; Consider possible CDC assistance.
- 6) Determine if EPA will be willing to share their draft Legionella guidance document being developed by a workgroup consisting of EPA, the States of Ohio, Minnesota, Pennsylvania, Washington, Nevada, Missouri and Nebraska, and CDC. The guidance will characterize the effectiveness of treatment technologies to address Legionella and address relevant regulatory implications. The primary implication is that individual customers that install “secondary” treatment systems to remove, reduce or prevent Legionella in their premise plumbing (such as hospitals are already doing) become by federal definition, public water systems required to comply with all applicable requirements of the Safe Drinking Water Act. The guidance has been delayed by internal reviews at EPA, but they are hoping to be able to have a final document in summer of 2015.

That's all I can think of at this point. Let me know what you think.

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Wednesday, March 11, 2015 9:37 AM  
**To:** Prysby, Mike (DEQ); Benzie, Richard (DEQ)  
**Subject:** RE: Information Request and Documentation

Mike,

I am not aware of a meeting request from Jim Henry or the Genesee County Health Department as indicated in his email below. Did you receive any such request?

The FOIA is specifically directed to the City of Flint not the DEQ. If requested some of the information asked for regarding Total Coliform and E.Coli compliance sampling could be provided, but there may also be additional construction repair sampling data.

We can respond to Jim when you get back in, but at this point while the change in source may have created water quality conditions that could provide additional organic nutrient source to support legionella growth, there is no evidence or confirmation of legionella coming directly from the Water Treatment Plant or in the community water supply distribution system at this time.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

---

**From:** Prysby, Mike (DEQ)  
**Sent:** Wednesday, March 11, 2015 7:35 AM  
**To:** Busch, Stephen (DEQ); Benzie, Richard (DEQ)  
**Subject:** Fwd: Information Request and Documentation

I am out today and will return tomorrow. Having trouble getting the attachment to open on my phone...but since it appears to be a FOIA regarding Legionella, I felt it is prudent to get this message to you. I will be available tomorrow to discuss or compile any info that we have.

Sent from my iPhone

Begin forwarded message:

**From:** "Henry, James" <jhenry@gchd.us>  
**Date:** March 10, 2015 at 6:40:17 PM EDT  
**To:** Howard Croft <hcroft@cityofflint.com>, "Mike Prysby (DEQ)" <prysbym@michigan.gov>, Elizabeth Murphy <emurphy@cityofflint.com>, "Natasha Henderson" <nhenderson@cityofflint.com>, Jerry Ambrose <gambrose49@gmail.com>, Dayne Walling <dwalling@cityofflint.com>  
**Cc:** "Valacak, Mark" <MVALACAK@gchd.us>, "Cupal, Suzanne" <scupal@gchd.us>, "Hasan, Shurooq" <shasan@gchd.us>, "Childs, Bonnie" <BCHILDS@gchd.us>, "Hallwood, Dawn" <dhallwood@gchd.us>, "Johnson, M.D., Gary" <GJOHNSON@gchd.us>  
**Subject:** Information Request and Documentation

Hello everyone,

The Genesee County Health Department has made several written and verbal requests for specific information since October, 2014, including a Freedom of Information Act Request on January 27, 2015. The information still has not been received and the city's lack of cooperation continues to prevent my office from performing our responsibilities.

The Genesee County Health Department has the responsibility to conduct illness investigations and consider all potential sources, this is not optional. In 2014, Genesee County experienced a significant increase of confirmed Legionella illnesses relative to previous years. Legionella can be a deadly, waterborne disease that typically affects the respiratory system.

The increase of the illnesses closely corresponds with the timeframe of the switch to Flint River water. The majority of the cases reside or have an association with the city. Also, McLaren Hospital identified and mitigated Legionella in their water system. This is rather glaring information and it needs to be looked into now, prior to the warmer summer months when Legionella is at its peak and we are potentially faced with a crisis.

This situation has been explicitly explained to MDEQ and many of the city's officials. I want to make sure, in writing that there are no misunderstandings regarding this significant and urgent public health issue. The Trihalomethane issues "pale in comparison" to the potential public health risks of Legionella.

I am submitting the attached FOIA request again and requesting that the legal obligations of the request are met. If the information is not available, please let me know. In the past, I have requested to meet with the water plant staff and MDEQ regarding Legionella concerns. I did not receive a response from the water plant staff and MDEQ declined. I think it is in the best interest for all stakeholders that we meet and discuss the issues.

Respectfully,

Jim

**Jim Henry**

Jim Henry RS, MBA

Environmental Health Supervisor

Genesee County Health Department [www.gchd.us](http://www.gchd.us)

630 S. Saginaw St., Suite 4

Flint, MI 48502-1540

Phone (810) 257-3618 Fax (810) 257-3125

E-mail [jhenry@gchd.us](mailto:jhenry@gchd.us)

Feb Report Prior to intake bids

Line → Mothball Costs  
for First WTP

Section 5 Capital Requirements TYST  
\$272,421,558 vs. \$357,578,060

Intake TYST \$29,816,063 Bid 24,600,000  
- \$5.3M

Pump Station

- Land Costs incorporated? Internal Sta. No logs Niled
- PS Designs vary This is Rural/Low Sanitary  
what are TYST basis of design \$/MG <sup>not</sup> added  
base basis
- 30% vs 25% - not tech basis

Transmission

- 30% vs. 25%
- Easement costs

Other Backup Power Not Required  
Overall

- interest etc ≤ 5% Anticipated Home income ≤ 1% more likely

River Optim Not consider DES concern

Fig 21 inaccurate

- Flint River Impacts for WW discharge downstream

RD + 72 both have repair needs

L. Huron Water

- Baseline Flint capacity to operate  
↑

- Costs neglect drop in 2012 after diff service

$$r \times 15 = \frac{X}{1.5}$$



8MGD From Detroit creates system issues  
usage

9MGD is current low flow (#4)

Ozone low flow

Call w/ Andy Dillon

Thurs. - Flint  
- Treasury / TWT

DWSD



16 MGD / 2 MGD

EFM Directs Mayor to ...  
Same EFA on Thursday

Final Contract in Oct → w/ Flint & others  
↳ Start of next FY

- 2 weeks ahead Intake Contract

- Leppert/Intake working on

- B site closing next week

- Prelim Hyd. Analysis → Surge Analysis

- WTP (Gen Co.) 2 sites Avail. next month

→ 1 month update meeting

cost estimates - steel prices  
- design PS & transmission  
- real estate

(810) 752-7870



- Breakup Issue <sup>Stress</sup> Limited Authority
  - Benton Tap / Benton Harbor
  - Benton Shores / Fruit Tap. Musk Ats → Musk

## - Cost Flood

- Can we say ~~that~~ KWA is ~~not~~ cost effective option

updated costs  
on current status

- Questions about DWSD <sup>option</sup> cost estimates
  - ↳ 8 MGD
  - ↳ 12 MGD

- How <sup>can</sup> we ~~assess~~ assess a \$ value on <sup>benefits</sup> ~~Regional~~ Regional vs. cost diff.

~~\$12M~~ \$12M Status Quo

## - Previous stakeholder involvement

Water withdrawal → DWSD comment + inability to address

DWSD - TXUT

- 30 yr contracts

current = Potter & Baxter

alt = Enbridge

DWSD - based on document elevation

- based on Mr. Day

2011 Analysis of Fort River as Perm. Water Supply?

- Mtg. w/ Flint + Treasury

- GCDC

- Rowe

- TYJT

- KWA

- Flint

-

- John O'Brien

- Dan Ingram, KWA

- Jeff Wright, GCDC

- Jim Kelling, Rowe

- John, Rowe

- Mike

- Jerry Ambrose, Flint

- Ed Ker

- Roger Stickley, Treasury Dept

Best Financial Interest to City of Flint

Flint  $\rightarrow$  worst  $\rightarrow$  back KWA  
\$100M  $\rightarrow$  \$30M

Driller  $\rightarrow$  cost over run issues?

- County could go back if City fails to pay  
All residents in Flint + GC

DWSD

- Pipe from Inlay to Flint  
Maintain

- Director's Points

- Cost Differences

- TYJT vs. Rowe

- Public Health

↳ Ability to

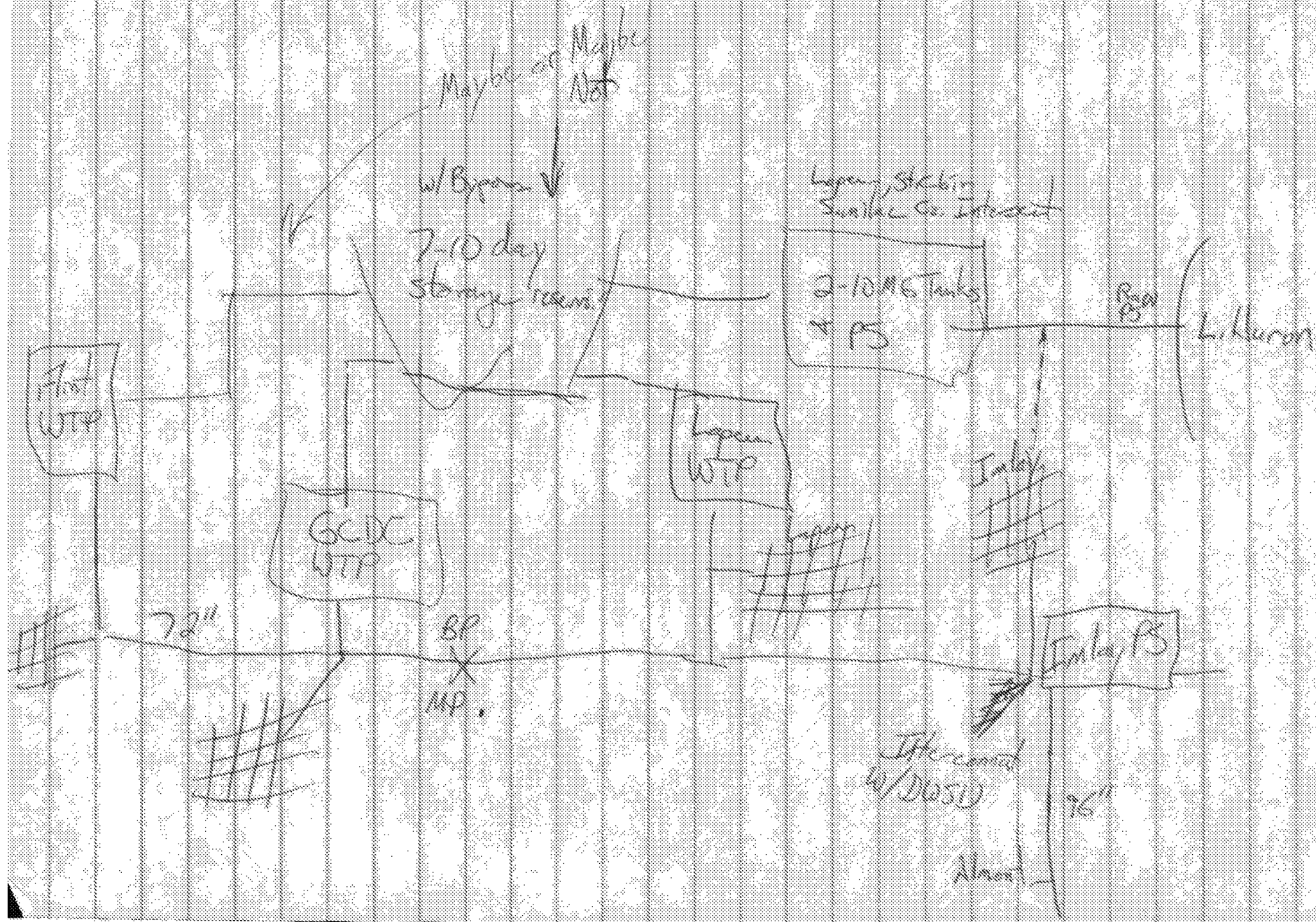
- Impact to others (DWSD, etc.)

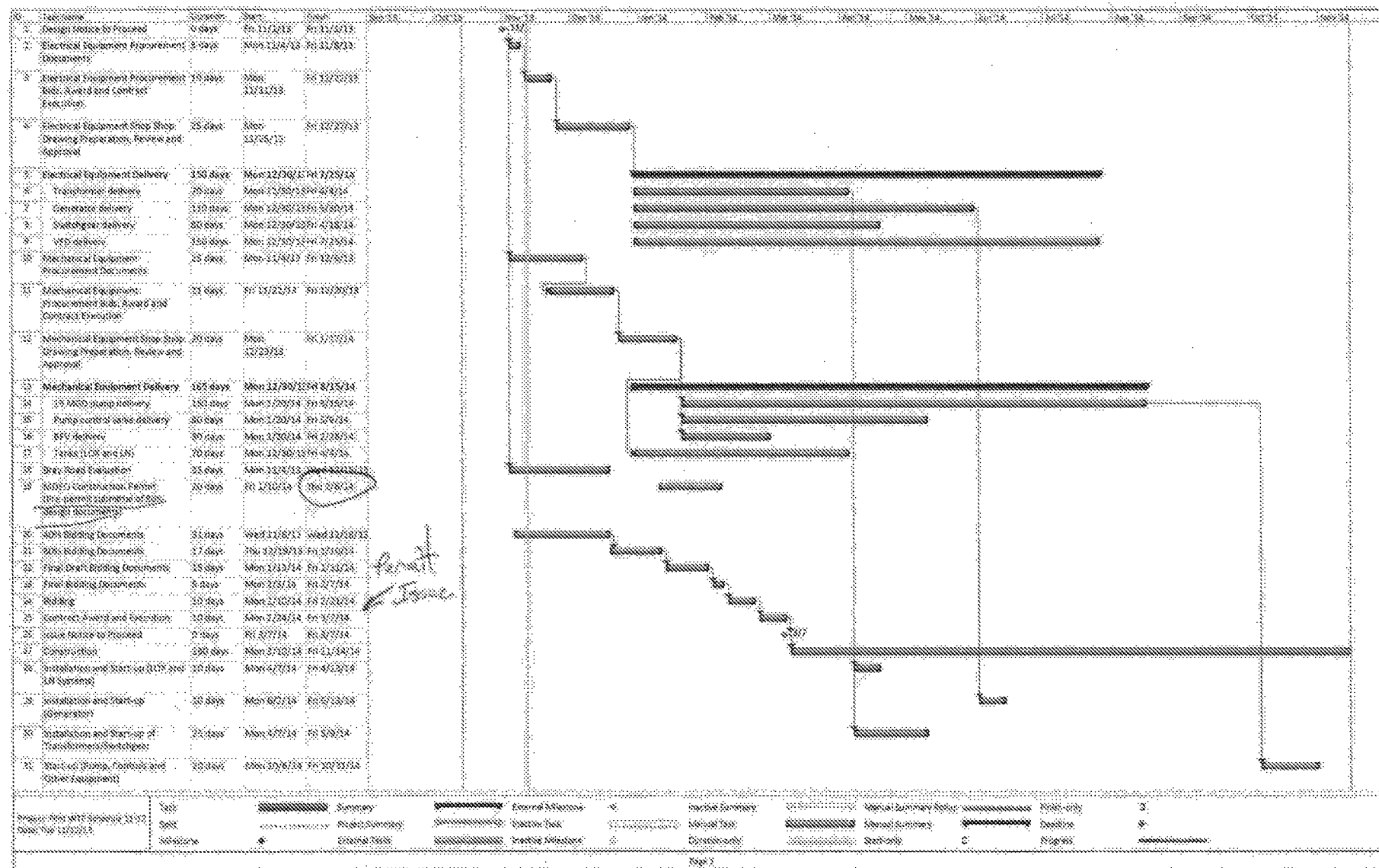
- Dual Line

↳



# KWA goes to Storage Reservoir





| Task Name | 2012                                           | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|-----------|------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1         |                                                |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2         |                                                |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 3         |                                                |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 4         | Develop budget                                 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 5         | Finalize list of upgrades and costs            |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 6         | Review FY14 carve out \$5.4 million            |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 7         | Do Budget Adjustment                           |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 8         | Seek Alternate funding                         |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 9         | Develop WP Step 1 April River Operation        |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 10        | LAN Change Order #2 (\$963k)                   |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 11        | Electrical upgrades (\$3.0 million)            |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 12        | Chlorine feed system (\$250k)                  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 13        | Staff hiring and training (5 additional)       |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 14        | Lime disposal (\$1.5 million)                  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 15        | Develop WP Step 2 River Reliability/efficiency |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 16        | SCADA upgrades                                 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 17        | Generator installation/start up                |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 18        | Pumping upgrades                               |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 19        | Additional Chemical storage                    |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 20        | Develop WP Step 3 KWA Operation                |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 21        | Dort Reservoir                                 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 22        | KWA raw water piping connection                |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 23        | Chemical Feed Alum                             |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 24        |                                                |      |      |      |      |      |      |      |      |      |      |      |      |      |

Michigan Department of  
Environmental Quality  
Community Water Supply

Information Regarding  
Total Trihalomethane (TTHM)  
Disinfection Byproducts

## DEQ - Community Water Supply

- Regulatory Authority over Public Water Systems
- Michigan Safe Drinking Water Act
- 1400 Community Supplies in MI (like Flint)
- Lansing Jackson Districts – 300 in 13 counties
- Oversight through:
  - Inspection
  - Monitoring
  - Construction Permitting
  - Planning
- Partnership and Compliance Assistance

## What are TTHM's

Trihalomethanes occur when natural organic matter in the water react with chlorine disinfectants.  
(Byproduct of disinfection process)

4 Chemical Compounds made up of these elements:

- Carbon
- Hydrogen
- Bromine
- Chlorine



## TTHM Standard

- Based on chronic exposure to low doses
- 80 parts per billion (0.080 ppm)
- Locational Running Annual Average (LRAA)
- Quarterly monitoring at each location
- Location and timing based on highest risk
- Running = over last 4 quarters, not calendar yr
- Total sum of 4 quarters not to exceed 320 ppb

Measured Dist<sup>n</sup> - The WTP not bat  
because by product worst case

## Flint TTHM Results

| TTHM Results (mg/L)                          | 5/21/14      | 8/21/14      | 11/20/14     | LRAA         | OEL          |
|----------------------------------------------|--------------|--------------|--------------|--------------|--------------|
| DBP1 McDonalds<br>3719 Davison               | <b>0.162</b> | <b>0.145</b> | 0.059        | <b>0.092</b> | <b>0.106</b> |
| DBP2 Liquor Palace<br>3302 S. Dort Highway   | <b>0.112</b> | <b>0.127</b> | 0.033        | 0.068        | 0.076        |
| DBP3 North Flint Auto<br>6204 N. Saginaw St. | <b>0.097</b> | <b>0.118</b> | 0.041        | 0.064        | 0.074        |
| DBP4 University Market<br>2501 Flushing Road | <b>0.106</b> | <b>0.196</b> | <b>0.094</b> | <b>0.099</b> | <b>0.122</b> |
| DBP5 Taco Bell<br>3606 Corunna Road          | 0.079        | <b>0.181</b> | 0.034        | 0.074        | <b>0.082</b> |
| DBP6 Rite-Aid<br>Pharmacy<br>5018 Clio Road  | <b>0.088</b> | <b>0.144</b> | 0.054        | 0.072        | <b>0.085</b> |
| DBP7 Salem Housing<br>3216 MLK Boulevard     | <b>0.082</b> | <b>0.112</b> | 0.050        | 0.061        | 0.074        |
| DBP8 BP Gas Station<br>822 S. Dort Highway   | 0.075        | <b>0.112</b> | 0.036        | 0.056        | 0.065        |



## Potential Health Effects Related to TTHM

- Federal Language
- Some people who drink water containing TTHM in excess of the MCL over many years could experience liver, kidney, or central nervous system problems and increased risk of cancer.

## Health Effect Basis by EPA

- Toxicology Studies - Uncertainty in using results of high-dose studies in animals to estimate risk to humans from chronic exposure to low doses in drinking water
- Epidemiology – Findings are contradictory. No conclusion of causal link between exposure and health effects.
- EPA determined evidence supports a potential hazard concern and establishment of standard.
- Considered best course of action at this time to reduce potential risks.

## TTHM Violation Requirements

- Water supply must take steps to reduce the amount of TTHM so that they are below the standard.
- Water supply must notify customers of the violation within 30 days of after learning of the violation.

## Operational Evaluation

- System treatment practices
- System distribution practices
- Storage tank operations
- Excess storage capacity
- Distribution system flushing
- Source water quality
- Treatment changes
- TTHM contributions
- Steps to minimize future standard violations

## Public Notification

- Designed to provide information to the customer to make more informed decisions
- Short term exposure to long term contaminant has different impact on each individual based on their background
- If health effects had been acute notification would be provided in 24 hours with specific actions for customers

# **Flint Drinking Water Press Conference Communications Plan**

Oct. 2, 2015

## Situation overview:

In May 2014, the city of Flint began drawing its drinking water from the Flint River, and left the Detroit Water and Sewerage Department. Recently, some city residents and outside activists have expressed concern about levels of lead in the drinking water. Although repeated testing demonstrates the water leaving the city of Flint's plant is free of lead contamination, Flint contains many old homes with lead plumbing, and some lead gets into individual homes' drinking water.

## Talking points:

- The water leaving Flint's water system is free of lead contamination; however, the state recognizes many older homes have lead pipes and therefore some measure of lead in the water that comes out of their taps
- While this is a problem with individual homes, the city, state and federal governments have come together to provide a number of actions to address the issue.
- This plan includes both short- and long-term solutions, and focuses on increasing water testing, offering additional precautions for families, and providing long-term solutions to address the city's water infrastructure.
- The action plan:
  - Gov. Rick Snyder names Dr. Eden Wells as the Flint Drinking Water Public Health Advisor.
  - Provide water filters to residents of Flint.
  - Continue to disseminate advisories recommending residents flush their cold water pipes before use, as well as use only water from the cold water tap for drinking, cooking and especially for making baby formula.
  - Immediately test Flint public schools to ensure that drinking water is safe. Testing also will be available at no cost to any other school in Flint.
  - Expand health exposure testing of individual residences.
  - Offer water testing at no cost to Flint residents to assure water is safe.
  - Fully optimize corrosion controls in the Flint drinking water system by Nov. 1, 2015.
  - Convene a "Safe Drinking Water Technical Advisory Committee" to ensure the best technology, practices and science are being utilized, and add an expert from the EPA's Office of Research and Development to the group.
  - Accelerate water system improvements to address replacement of lead service lines.
  - Expedite completion of Karegnondi Water Authority.

## Audiences:

- Media
- City of Flint and surrounding communities

## Media outreach

Oct. 2

Press conference held at a time TBD

- Dayne Walling – Mayor of Flint
- Dan Wyant – DEQ Director
- Nick Lyon – DHHS Director
- Susan Hedman – Region 5 Administrator for EPA
- Harvey Hollins – Governor's Office
- Representative from the Local Public Health Department
- Congressman Dan Kildee to be invited
- State Sen. Jim Ananich to be invited

## Media list

- Ron Fonger, MLive/Flint Journal
- Nick Lulli or other, WNEM TV5
- WJRT ABC 12
- WEYI NBC 25
- Steve Carmody, Michigan Radio
- MIRS
- Gongwer
- Jim Lynch or Chad Livengood, Detroit News
- Nancy Kaffer, Detroit Free Press
- Ed White or Jeff Karoub, Associated Press
- Stateside, WKAR

## Supporting materials in media kit

- Press release
- FAQ
- Timeline
- One-pager
- Infographic

## Social media

Oct. 2

DEQ (as well as DHHS and Governor's office?) Twitter

- During event: Still images of press conference
- At event's conclusion: Link to press release
- 30 minutes after conclusion: Link to FAQ document
- ASAP: Video news release

## YouTube

- Video news release
- Footage of each speaker's comments





Michigan Department of Health and Human Services  
Flint Blood Lead Levels Communication Plan  
October 1, 2015

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Situation overview:

After a change in the water source for Flint residents, there have been concerns related to the level of lead in the water and its impact on the community. As a result, the Michigan Departments of Health and Human Services, and Environmental Quality, are working with the local health department and Hurley Children's Hospital to analyze the situation and determine next steps.

Goals/objectives:

- Ensure public health partners and the elected officials are aware of MDHHS data analysis.
- Announce availability of water filters for Flint residents.

Audiences:

- Media/Flint residents
- Governor's Office
- Congress and Legislature
- Public Health Partners: Genesee County Health Department and Hurley Children's Hospital
  - Mark Valacek, LHD Health Officer
  - Gary Johnson, LHD Medical Director
  - Mona Hanna-Attisha, MD
  - Lawrence Reynolds, MD
  - Paul Joice, Dept. of Housing and Urban Development

Action steps/tools with timeline:

1. Friday, October 2:
  - *Timing TBD:* Provide data to Hurley Children's Hospital and Genesee County Health Department
  - *Timing TBD:* Notify Congressman Kildee and local elected officials of announcement
  - 1:30 p.m.: Press event with MDHHS, DEQ, EPA
    - i. Issue joint Press Release
  - Schedule 1x1 Media Interviews with Dr. Eden Wells
    - i. Kristi Tanner, Detroit Free Press
    - ii. Ed White, Associated Press
    - iii. Ron Fonger, MLive
    - iv. Sarah Hulett, Michigan Radio
2. Week of October 5-9
  - Schedule visit at Flint MDHHS office and Director Lyon
    - i. Invite media?
  - Follow up with Kristi Tanner: Detroit Lead Analysis

MDHHS Topline Messages:

- Initial analysis of MDHHS data found that blood lead levels (BLLs) of children in Flint have followed the seasonal trend. While this analysis of Flint as a whole remains true, after a more comprehensive analysis by our epidemiologists, the MDHHS has found that state data is consistent with the data presented by Hurley for specific zip codes.
- Upon conducting an analysis to analyze the zip codes within Flint that Hurley used in their study, MDHHS data does show that since the water source change in Flint has occurred, there has been an increase in childhood elevated lead levels in these communities.
- MDHHS is recommending that residents follow the Public Health Advisory issued by the Genesee County Health Department, as well as take further steps to reduce exposures to all forms of lead in and around their homes.
  - We understand that cost may be a barrier to following the recommendations of the local health department. We are actively working with public and private partners to make resources available to those who may need assistance.

## DEQ Timeline

1/28/2015 - Meeting requested by Hurley Hospital and McLaren hospital with Department of Community Health (now Dept. of Health and Human Services) and Department of Environmental Quality staff concerning Genesee County Health Department response to Legionellosis Investigations.

1/30/2015 DEQ provided DCH staff with City of Flint water system information.

3/17/2015 – DEQ call and email to the City of Flint regarding optimization strategies to help minimize the potential for outbreaks in customer plumbing systems

3/10/2015 – 3/19/2015 – Discussion with Genesee County Health Department regarding information requests Genesee County made to the City of Flint (DEQ shared with DCH on 3/12)

4/8/2015 – Conference call between DCH (DHHS) and DEQ regarding DCH case and epidemiology status update (Prysby and Shekter Smith)

4/9/2015 – 4/10/2015 – DEQ staff attended smart water summit via live stream on Legionella issues

4/14/2015 – Meeting between DCH (DHHS) and DEQ (Prysby, Busch, Philip, Shekter Smith)

4/14/2015 – DEQ call with EPA regarding EPA ORD assistance abilities for City and DCH.

4/24/2015 – DEQ emailed DCH with City of Flint water quality information from sampling and operational monitoring

4/24/2015 – DEQ notified DCH via email of meetings with hospitals scheduled for 4/29/2015

4/29/2015 – DEQ Meetings with the following regarding secondary treatment and premise plumbing

- Hurley Hospital
- McLaren Hospital
- City of Flint Cross Connection Inspection/Plumbing Inspector

5/1/2015 – DEQ emails with information regarding water safety plans and best practices to

- Hurley Hospital
- McLaren Hospital

5/1/2015 – DEQ emails to City of Flint Cross Connection Inspector / Plumbing Inspector with info on identifying customers that should consider development of a Water Safety Plan for their premise plumbing

5/5/2015 – DEQ ODWMA internal meeting to discuss how to proceed regarding secondary treatment

5/12/2015 – Response from the City of Flint with list of customers that may need a Water Safety Plan

6/5/2015 – 6/8/2015 – Email communications between Genesee County Health Department and DCH regarding epidemiology status update

6/15/2015 – DEQ Meeting with Dept. of Licensing and Regulatory Affairs regarding Secondary Treatment

6/19/2015 – DEQ Letter to Michigan Society for Health Care Engineering and Michigan Health and Hospital Association regarding secondary treatment

7/30/2015 – DEQ Holds Hospital/Health Care Facility Treatment of Water Received from a Public Water Supply Meeting

Benzie, Richard (DEQ)

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**From:** Shekter Smith, Liane (DEQ)  
**Sent:** Wednesday, March 18, 2015 10:33 AM  
**To:** Benzie, Richard (DEQ); Crooks, Jennifer  
**Subject:** RE: Information Request and Documentation

Sure, I'll try Tom now.

Liane J. Shekter Smith, P.E., Chief  
Office of Drinking Water and Municipal Assistance  
Michigan Department of Environmental Quality  
517-284-6543

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**From:** Benzie, Richard (DEQ)  
**Sent:** Wednesday, March 18, 2015 10:29 AM  
**To:** Crooks, Jennifer  
**Cc:** Shekter Smith, Liane (DEQ)  
**Subject:** Re: Information Request and Documentation

I will try. Maybe Liane can also talk with Tom before I may be able to get a chance.

Sent using OWA for iPhone

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**From:** Crooks, Jennifer <[crooks.jennifer@epa.gov](mailto:crooks.jennifer@epa.gov)>  
**Sent:** Wednesday, March 18, 2015 9:53:19 AM  
**To:** Benzie, Richard (DEQ)  
**Subject:** RE: Information Request and Documentation

Hi, Richard. I know you've been in training this week, but I'm wondering if you'd be able to call Tom Poy when you get a minute to discuss this issue below. He understands that you may need to keep some internal discussions under your hat right now, but he wants to touch base with you—He's working on this from EPA end, and wants to provide assistance to you all.  
Jen

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**From:** Benzie, Richard (DEQ) [<mailto:BENZIER@michigan.gov>]  
**Sent:** Thursday, March 12, 2015 6:22 PM  
**To:** Poy, Thomas; Crooks, Jennifer  
**Subject:** FW: Information Request and Documentation  
**Importance:** High

Please treat this information as confidential at this point as I am not sure when and who will bring this matter forward for public knowledge. But I thought you should get a heads up that another problem could become public soon. Liane forwarded the message from Genesee County to our management this morning along with the attached document, but we have not received a response yet. She also contacted the Department of Community Health and they are following up with the County. They told Liane that they have been offering assistance to the county on this matter on several occasions and had not received a response.

Steve and Mike indicated that they were not contacted by the county on this issue as stated in the attachment, so we don't know who they did contact or if they did. We suspect they are escalating the request for information at this time, but we also wonder why they need much of the information they requested from the city to conduct their investigation, which should have

## STANDARD OPERATING PROCEDURE

### Response to a Legionella Outbreak

DEP is notified of a  
Legionella outbreak

The facility is a  
PWS

#### DEP's Role:

- Take the lead:
  - Ensure actions are taken for immediate public health protection (close facility if possible, restrict water use, issue PN, provide alternate water, POU filters)
  - Provide contacts for consultants
  - Assist with sampling plan
  - Assist with remediation plan (solids removal, super chlorination, heat treatment)
  - Issue emergency and/or construction/operations permits as needed
- Coordinate with other agencies as needed

#### PWS Investigation:

- Conduct on-site inspection
- Review historical records/sample data
- Determine efficacy of primary and secondary disinfection
  - Confirm CTs
  - Confirm residual of at least 0.5 mg/L (free) or 1.0 mg/L (total)
- Sample for  $Cl_2$ , *E. Coli*, HPC, Legionella
- Review source water protection
- Review distribution system issues:
  - CCC Plan/cross-connections
  - Water line breaks
  - O&M Plan/flushing program
  - Excessive water age/storage tank turnover/dead ends

The facility is a  
customer of a PWS

#### DEP's Role:

- Assist DOH in advising the facility:
  - Make suggestions for immediate public health protection (close facility if possible, restrict water use, PN, provide alternate water, POU filters)
  - Provide contacts for consultants
  - Assist with sampling plan
  - Assist with remediation plan (solids removal, super chlorination, heat treatment)
  - Respond to request for installation of on-going treatment (triggers SDWA)
- Coordinate with other agencies as needed
- Investigate the selling PWS

#### Selling PWS Investigation:

- Conduct on-site inspection
- Review historical records/sample data
- Determine efficacy of secondary disinfection
  - Confirm residual of at least 0.5 mg/L (free) or 1.0 mg/L (total)
- Sample for  $Cl_2$ , *E. Coli*, HPC
- Review distribution system issues:
  - CCC Plan/cross-connections
  - Water line breaks
  - O&M Plan/flushing program
  - Excessive water age/storage tank turnover/dead ends

### **Legionellosis:**

Legionellosis is an acute bacterial disease with two commonly identified manifestations: Legionnaires disease and Pontiac fever. Symptoms are typical of "flu": fever, chills, malaise, headache etc. The infectious agent is *Legionella pneumophila*, which includes nine serogroups. Sampling typically will identify multiple serotypes. The bacteria are ubiquitous; outbreaks are most common in summer and autumn. The bacteria are typically found in groundwater and soil and are ultimately capable of colonizing water systems, especially hot water and air conditioning systems. *Legionella* can exist as free floating bacteria, they can infect and multiply in amoebae, they can survive in biofilms, and they exist in pipe scale and sediment. The elderly, smokers, and immune-compromised individuals are especially at risk. Hospitals, nursing homes, hotels etc. are commonly associated with *Legionella* outbreaks. The primary risk is via inhalation of aerosolized water that has been colonized by the bacteria.

### **Internal communication:**

The Department is typically made aware of a potential *Legionella* outbreak as a result of a DOH investigation. A *Legionella* outbreak draws attention from a number of agencies and requires communication and participation among all, regardless of which agency is taking the lead (CDC, DEP, DOH, Veterans Affairs, etc.). The Region should communicate details of the potential outbreak to RD/ARD, ER, BSDW, etc. Be prepared to involve the CDC and respond to concerns from the public.

### **Immediate response by DEP staff:**

Once an outbreak is confirmed, Regional staff must establish communication with persons responsible for the facility. Facilities with temporary residents (hotels, motels, convention centers, casinos, etc.) should be closed until remediation can occur. Facilities with residential populations (hospitals, dormitories, nursing homes, etc.) should be encouraged to restrict water use and take all necessary actions. Public notification should be issued and if the facility hesitates or refuses, the Department must act to protect public health and issue the PN unilaterally. At some point the Department may be asked to participate in sampling to confirm the presence of *Legionella*. Staff should sample the source before treatment, as well as throughout the facility, two samples per floor, both hot and cold water.

Assuming a cooperative facility, a remediation plan is essential, (see ASHRAE Standard 188 for contents of a Hazard Analysis and Critical Control Point HACCP plan).

- Remediation consists of three major components: solids removal, chlorine burn and heat treatment.

- The system must be effectively flushed to remove solids from tanks, water heaters, the distribution system, etc. Initiate chlorine disinfection with a dose of 50 mg/L, flush and hold at greater than 2 mg/L for two hours throughout the system then flush chlorine from hot and cold systems.
- Heat treatment with a goal of greater than 160 degrees in heaters for at least 24 hours followed by flushing through distribution system with greater than 120 degree water for five minutes at each tap.

Before returning to use, the system must sample and remediate until the effectiveness of the remediation can be established.

Concurrent with the remediation process, the facility should begin design and permitting of a long term solution, either for continuous treatment, intermediate remediation or for temporary treatment as the need arises. Design standards to consider: CT of 10 mg/L minute to inactivate free floating *Legionella* bacteria; 100 mg/L minute to inactivate *Legionella* within amoeba.

**Consider the possibility of issuing an Emergency Permit:**

Title 25, Chapter 109.506, the Department is amenable to issuing an emergency permit for installation of a permanent disinfection system at the PWS. Please understand that issuance of an emergency permit includes some abbreviated procedures designed to allow the Department and public water supplier to address public health needs as quickly as possible; however, issuance of an emergency permit will not relieve the facility of the requirement to also obtain conventional public water supply permits.

**Typical Permit Conditions for Construction and Operations Permits:**

The permit is issued subject to all Department of Environmental Protection (Department) Rules and Regulations now in force and the following Special Conditions:

1. The Entry Point (X) treatment facility shall be operated in accordance with the following conditions to provide 4-log treatment of viruses and inactivation of *Legionella* bacteria:
  - A. The instantaneous maximum flow through the treatment system shall not exceed X (number) gallons per minute.
  - B. The minimum free chlorine residual at the entry point shall not be less than 0.50 mg/L.
  - C. Continuously monitor the free chlorine residual at the entry point and record the results at least every 15 minutes each day that water is served to the public. If there is a failure of the continuous monitoring equipment, conduct grab sampling every 4 hours until the

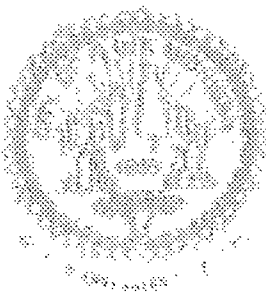
continuous monitoring equipment is returned to service. The system shall return to continuous residual disinfectant monitoring within 14 days.

2. The minimum free chlorine residual at all points in the distribution system shall not be less than 0.50 mg/L.
3. (*Public Water Supplier*) shall conduct *Legionella* enumeration sampling. Sampling shall be conducted at least once per month. A minimum of X(X) samples (X from each floor) shall be collected and analyzed during each sampling event. The samples shall be collected from taps located in the X. Of the minimum X samples, half shall be from cold water taps and half shall be from hot water taps. Please submit the sample results to the Department's X District Office at:

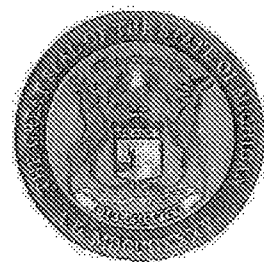
Department of Environmental Protection  
X Regional Office  
Safe Drinking Water Program  
address  
City, PA 17110-8200  
Phone: xxx.xxx.xxxx  
Fax: xxx.xxx.xxxx

4. Prior to the issuance of an operation permit, the permittee shall develop and submit to the Department a Hazard Analysis and Critical Control Plan (HACCP) as referenced in BSR/ASHRAE Standard 188P - Prevention of Legionellosis Associated with Building Water Systems, Third Public Review Draft, January 2013. If and when Standard 188P is finalized, the permittee shall update the HACCP as needed to comply with the final standard and submit an updated copy to the Department.
5. Prior to issuance of an Operation Permit, the facilities shall be properly disinfected in accordance with 25 PA Code, Chapter 109.711 of the Safe Drinking Water regulations and the most recent procedures established by the American Water Works Association (AWWA). The facilities shall be tested for total coliforms in accordance with AWWA standards. The samples shall be analyzed by a Department-accredited laboratory. Two copies of the satisfactory microbiological test results shall be submitted with the *Certificate of Construction/Modification*.
6. Upon completion of construction in accordance with the approved plans and specifications, the permittee shall submit the *Certificate of Construction/Modification* to the Department. Certification shall state that the work was completed in accordance with the approved plans and specifications and shall be signed by the professional engineer or other person responsible for the work. Certification shall include that adequate operation and maintenance information for the approved facilities is available, on site, for use by the public water system's personnel.





**CITY OF FLINT**  
**OFFICE OF THE EMERGENCY MANAGER**



**Gerald Ambrose**  
**Emergency Manager**

**TO:** Wayne Workman, Deputy Treasurer  
Treasury Department  
State of Michigan

**FROM:** Jerry Ambrose, Emergency Manager  
City of Flint

**DATE:** March 3, 2015

As the Emergency Manager for the City of Flint, I am charged with restoring the City government to financial solvency, and working to assure that the City moves forward on a financially sustainable basis. The steps taken over the past three years have been difficult. Taxes and fees have been raised, services and workforce reduced, and ongoing costs, including legacy costs, have been constrained.

The current controversy surrounding the provision of water, and the path for resolution, has a potentially significant impact on the progress that is being made. I am satisfied that the water provided to Flint users today is within all MDEQ and EPA guidelines, as evidenced by the most recent water quality results conducted for MDEQ. We have a continuing commitment to maintain water safety and to improve water quality, and have dedicated resources to assure this commitment will be made.

The oft-repeated suggestion that the City should return to DWSD, even for a short period of time, would, in my judgment, have extremely negative financial consequences to the water system, and consequently to the rate payers. By the most conservative estimates, such a move would increase costs by at least \$12 million annually, with that amount achieved only by eliminating virtually all budgeted improvements in the system. For a system with Unrestricted Assets of only \$740,745, according to the June 30, 2014 audited financial statements, the only recourse within the City's control would be to increase revenues significantly. And in my judgment, that would come from raising rates for water by 30% or more. Further, changing the source of the city's water would not necessarily change any of the aesthetics of the water, including odor and discoloration, since those appear to be directly related to the aging pipes and other infrastructure that carry water from the treatment facility to our customers.

Wayne Workman

March 3, 2015

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This direction of discussion also deviates from what, in my judgment, should be the focus: How can we not only operate and maintain a system to assure the delivery of safe and quality water dependably, but significantly reduce the cost of water and sewer to the users? At an average of \$149 per month for water and sewer service for a residential user, the cost is extremely high in comparison to surrounding areas, as well as most areas across the state, and creates a significant financial burden for many users. In my judgment, we should all be concentrating on how to reduce rates by 50% or more. Unfortunately, there are no easy or evident answers, and continuation of the status will be an impediment to the sustainable recovery of the City of Flint. It is a conversation that I expect we will have with the recently created Water Quality Advisory Committee.

My reasoning for this conclusion is as follows:

One of the decisions made in the context of beginning to eliminate deficits and to restore financial stability to the City of Flint was to increase water and sewer rates significantly – the only choice available to financially stabilize a system that as of June 30, 2012, had a deficit of \$8,758,091. Another was to leave DWDS for the KWA because it offered the opportunity to lower future rate increases. A third decision was to utilize the Flint River on an interim basis when DWSD unilaterally terminated the City's contract for water purchase. That decision was made because it also offered an immediate cost savings opportunity which translated into the ability to upgrade the Water Treatment Plant without having to seek financing. It was a reasonable decision because of our experience in using the river in a back-up capacity, including test runs on a quarterly basis for several decades.

Unfortunately, the switch to the river as a primary source was more challenging than anticipated, and the harsh winter of 2013-2014 resulted in much more damage to the aging water infrastructure than in previous years. The result was the issuance of required notices that water exceeded established guidelines for safety as it could affect certain vulnerable populations, and some users of the system experienced unpleasant odors and discoloration. Some users also appeared to have had some negative reactions to the new source of water. However, as soon as the test results were known, City staff took immediate actions to address the concerns. These actions are evidenced today by the fact that MDEQ has certified that our most recent testing shows water from all testing sites to be well within acceptable guidelines. Additionally, the City is continuing to taking the necessary actions to assure that the water supply remains safe and that water quality continues to improve.

As the City has moved to address the situation, the suggestion continues to be made that the City should re-engage with DWSD and purchase water at least until the KWA pipeline is supplying water. As evidenced by the most recent letter from DWSD, such a decision would immediately increase the City's cost by \$846,700 per month, or \$10,160,400 per year, just for the fixed cost portion of the price. The actual *purchase* of water would be an additional fee, and dependent upon

Wayne Workman  
March 3, 2015  
Page 3

the quantity purchased. We estimate the actual water purchase cost to average more than \$1 million per month, for a grand total of approximately \$22 million per year. Finally, the DWSD offer is conditioned upon the City (or presumably the KWA) agreeing to negotiate a long term contract (30 years) for back-up.

The \$22 million annual estimate of increased costs to purchase water from DWSD would be minimally offset by an approximate \$3 million in reduced operating costs, and could be further offset by an additional \$9 million, but only if all funding for capital improvements to the system are eliminated. To eliminate all funding dedicated to repairing, stabilizing, and improving the system would be totally irresponsible and would have long term negative consequences to the City and to future rate payers.

As you are aware we have recently brought in outside expert assistance to evaluate the steps we have taken to assure that the water is safe and to continue to improve water quality. We are expecting specific recommendations within the next few weeks, and are committed to implementing those recommendations in a timely manner. Many steps have already been taken. I am confident that implementing their recommendations will assure a continuing supply of safe water as well as improved quality, and at far less cost than re-engaging DWSD.

We have also created a 40-member Water Advisory Committee and a 13-member Technical Advisory Committee to assure two-way communication with the public and users of the system. Those committees will begin to meet this week, and we look forward to answering their questions and receiving their input.

It is unfortunate that problems and concerns with quality have arisen, and we are working every day to address the issues that caused them. Maintaining safe water and improving quality is a top priority as we work to make the City of Flint an attractive place to live, work, study, and play.

02/09/2015

UTILITY WIDE WATER FUND PROFESSIONAL SERVICES  
PERIOD ENDING 02/28/2015

| ACCOUNT DESCRIPTION                                  | 2014-15<br>AMENDED<br>BUDGET | ACTIVITY FOR<br>MONTH<br>02/28/2015 | YTD BALANCE<br>02/28/2015 | ENCUMBERED<br>YEAR-TO-DATE | UNENCUMBERED<br>BALANCE | % BDGT<br>USED |
|------------------------------------------------------|------------------------------|-------------------------------------|---------------------------|----------------------------|-------------------------|----------------|
| <b>Dept 536 100-Utilities - Water Administration</b> |                              |                                     |                           |                            |                         |                |
| Fund 591 - Water Fund                                |                              |                                     |                           |                            |                         |                |
| 801.000 Professional Service                         | 2,320,000.00                 | 50,418.75                           | 537,844.65                | 348,549.88                 | 1,433,605.47            | 38.23          |
| ROWE City Engineering                                |                              |                                     | contract \$               | 79,000.00                  |                         |                |
| Dump Site Analysis                                   |                              |                                     | contract \$               | 42,892.00                  |                         |                |
| LAN Water Implementation                             |                              |                                     | contract \$               | 244,900.00                 |                         |                |
| JFA /U.S. Dept Interior                              |                              |                                     |                           |                            | \$ 27,295.00            |                |
| Raftelis Financial Update                            |                              |                                     |                           |                            | \$ 23,810.00            |                |
| Bray Road                                            |                              |                                     |                           |                            | \$ 500,000.00           |                |
| TTHM Violation Letters/Mailings                      |                              |                                     |                           |                            | \$ 25,000.00            |                |
| MDEQ Permit Fees                                     |                              |                                     |                           |                            | \$ 100,000.00           |                |
| Energy Costs/Performance Contracts                   |                              |                                     |                           |                            | \$ 250,000.00           |                |
| Veolia Water Consultant                              |                              |                                     |                           |                            | \$ 40,000.00            |                |
| City Works/Assesment Management                      |                              |                                     |                           |                            | \$ 350,000.00           |                |
| Operational Contingency                              |                              |                                     |                           |                            | \$ 117,500.00           |                |
| Total Dept 536 100-Utilities - Water Administration  |                              |                                     |                           | \$ 366,792.00              | \$ 1,433,605.00         |                |
| <b>Dept 540 100-Water Service Center Management</b>  |                              |                                     |                           |                            |                         |                |
| Fund 591 - Water Fund                                |                              |                                     |                           |                            |                         |                |
| 801.000 Professional Service                         | 374,400.00                   | 0.00                                | 74,877.03                 | 250,869.51                 | 48,653.46               | 87.00          |
| Sewerlines City Engineering                          |                              |                                     | contract \$               | 190,000.00                 |                         |                |
| Internal Investigations                              |                              |                                     | contract \$               | 95,645.22                  |                         |                |
| Landfill Services                                    |                              |                                     |                           |                            | \$ 12,500.00            |                |
| Janitorial Services                                  |                              |                                     |                           |                            | \$ 4,260.00             |                |
| After Hours Water & Staking                          |                              |                                     |                           |                            | \$ 2,500.00             |                |
| Line Stopping                                        |                              |                                     |                           |                            | \$ 25,000.00            |                |
|                                                      |                              |                                     |                           | 285,645.22                 | 44,260.00               |                |

Fund 591 - Water Fund

Current group covers a \$100,000 of

Fund 591 - Water Fund

## Value Exercising

|    |           |    |              |
|----|-----------|----|--------------|
| \$ | 50,000.00 | \$ | 2,500,000.00 |
|----|-----------|----|--------------|

## Fund 591 - Water Fund

## Dam inspections

|    |           |    |           |
|----|-----------|----|-----------|
| \$ | 30,323.02 | \$ | 60,000.00 |
|----|-----------|----|-----------|

## Fund 501 - Water Fund

## Vibration Analysis

|           |      |          |    |           |    |          |       |
|-----------|------|----------|----|-----------|----|----------|-------|
| 26,000.00 | 0.00 | 3,700.00 | \$ | 12,955.00 | \$ | 9,000.00 | 64.06 |
|-----------|------|----------|----|-----------|----|----------|-------|

Dept 545.300-Water Plant - Capital improvements

Fund 591 - Water Fund

|                                                       |                                |              |      |             |                 |               |       |
|-------------------------------------------------------|--------------------------------|--------------|------|-------------|-----------------|---------------|-------|
| 801.000                                               | Professional Service           | 2,900,000.00 | 0.00 | 927,098.07  | 1,296,474.81    | 676,427.12    | 76.67 |
|                                                       | Installation of Storage Tanks  |              |      | contract \$ | 716,272.00      |               |       |
|                                                       | Motor Control Upgrade          |              |      | contract \$ | 440,157.00      |               |       |
|                                                       | Easement- Electrical Grounding |              |      | contract \$ | 4,054.00        |               |       |
|                                                       | Line Residual                  |              |      | contract \$ | 135,991.81      |               |       |
|                                                       | Cedar Street Pump Station      |              |      |             |                 | \$ 500,000.00 |       |
|                                                       | Pump Station Feeder            |              |      |             |                 | \$ 125,000.00 |       |
|                                                       | TTHM Operational Evaluation    |              |      |             |                 | \$ 50,000.00  |       |
| Total Dept 545.300-Water Plant - Capital improvements |                                | 2,900,000.00 | 0.00 |             | \$ 1,296,474.81 | \$ 675,000.00 | 76.67 |

| Total | Budgeted       | YTD Balance    | Encumbered     | Unencumbered   |
|-------|----------------|----------------|----------------|----------------|
|       | \$5,420,400.00 | \$1,552,386.73 | \$2,032,690.05 | \$4,821,865.00 |

# WATER FUND EXPENSES

| WATER AND SEWER EXPENSES                                   |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|------------------------------------------------------------|-------------------------------|---------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------------------|--------------------------------------------------------------------------|
| GL NUMBER                                                  | DESCRIPTION                   | 2013-14<br>ACTIVITY | 2014-15<br>AMENDED<br>BUDGET | 2015-16<br>APPROVED<br>BUDGET | 2015-16                       | 2015-16                       | STATUS QUO                                | 2015-16                                                                  |
|                                                            |                               |                     |                              |                               | BUDGET<br>CHANGES<br>FOR DWSD | BUDGET<br>CHANGES<br>FOR DWSD | REVISED<br>2015-16<br>BUDGET<br>WITH DWSD | BUDGET<br>CHANGES<br>WITH DWSD &<br>ALL CAPITAL<br>FUNDING<br>ELIMINATED |
| <b>Expenses - Water Fund</b>                               |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
| <b>Dept 536-100-Utilities - Water Administration</b>       |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Wages and Fringes             | \$76,155            | \$528,777                    | \$445,851                     |                               |                               | \$445,851                                 |                                                                          |
|                                                            | Repairs and Improvements      | \$2,497,397         | \$2,320,000                  | \$2,320,000                   |                               | \$0                           | \$2,320,000                               | (\$2,320,000)                                                            |
|                                                            | Other Expenses                | \$2,295,410         | \$2,248,750                  | \$2,248,750                   |                               |                               | \$2,248,750                               |                                                                          |
| <b>Dept 540-100-Water Service Center Management</b>        |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Wages and Fringes             | \$199,883           | \$228,451                    | \$256,343                     |                               |                               | \$256,343                                 |                                                                          |
|                                                            | Repairs and Improvements      | \$140,599           | \$374,400                    | \$350,000                     |                               | \$0                           | \$350,000                                 | (\$350,000)                                                              |
|                                                            | Other Expenses                | \$106,780           | \$477,292                    | \$547,649                     |                               | \$0                           | \$547,649                                 |                                                                          |
| <b>Dept 540-200-Water Reading - Water</b>                  |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Wages and Fringes             | \$439,351           | \$488,365                    | \$481,316                     |                               | \$0                           | \$481,316                                 |                                                                          |
|                                                            | Other Expenses                | \$151,894           | \$64,000                     | \$64,000                      |                               | \$0                           | \$64,000                                  |                                                                          |
| <b>Dept 540-202-Water Distribution Mains</b>               |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Wages and Fringes             | \$2,393,598         | \$3,006,530                  | \$3,024,627                   |                               | \$0                           | \$3,024,627                               |                                                                          |
|                                                            | Repairs and Improvements      | \$391               | \$60,000                     | \$85,000                      |                               | \$0                           | \$85,000                                  | (\$85,000)                                                               |
|                                                            | Other                         | \$1,210,118         | \$920,457                    | \$849,500                     |                               | \$0                           | \$849,500                                 |                                                                          |
| <b>Dept 545-200-Water Plant - Operations</b>               |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Wages and Fringes             | \$988,529           | \$1,827,008                  | \$1,761,027                   | Staffing                      | (\$576,088)                   | \$1,384,929                               |                                                                          |
|                                                            | Repairs and Improvements      | \$48,723            | \$80,000                     | \$80,000                      |                               |                               | \$80,000                                  | (\$80,000)                                                               |
|                                                            | Supplies, Utilities and Other | \$22,779,389        | \$3,445,656                  | \$3,318,656                   |                               |                               | \$23,960,446                              |                                                                          |
|                                                            |                               |                     |                              |                               | Fixed Charge DWSD             | \$10,160,400                  |                                           |                                                                          |
|                                                            |                               |                     |                              |                               | Commodity Chg DWSD            | \$12,818,190                  |                                           |                                                                          |
|                                                            |                               |                     |                              |                               | Chemical Purchase             | (\$1,486,800)                 |                                           |                                                                          |
|                                                            |                               |                     |                              |                               | Electrical Power              | (\$850,000)                   |                                           |                                                                          |
| <b>Dept 545-202-Water Plant - Dam Operations</b>           |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            |                               | \$119,216           | \$0                          | \$0                           |                               |                               | \$0                                       |                                                                          |
| <b>Dept 545-203-Water Plant - Dam Maintenance</b>          |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            |                               | \$128,628           | \$0                          | \$0                           |                               |                               | \$0                                       |                                                                          |
| <b>Dept 545-300-Water Plant - Capital Improvements</b>     |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Repairs and Improvements      | \$968,815           | \$2,900,000                  | \$1,200,000                   |                               |                               | \$1,200,000                               | (\$1,200,000)                                                            |
|                                                            | Other                         | \$980,161           | \$3,700,000                  | \$2,400,000                   |                               |                               | \$2,400,000                               |                                                                          |
| <b>Dept 900-100-Cost Allocation and Retiree Healthcare</b> |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            |                               | \$3,111,662         | \$5,600,242                  | \$6,077,577                   |                               |                               | \$6,077,577                               |                                                                          |
| <b>Dept 966-101-PILOT Payment</b>                          |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            |                               | \$1,130,000         | \$1,130,000                  | \$1,130,000                   |                               |                               | \$1,130,000                               |                                                                          |
| <b>Dept 966-493-Debt Service</b>                           |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            |                               | \$2,638,071         | \$2,638,071                  | \$2,638,071                   |                               |                               | \$2,638,071                               |                                                                          |
| <b>Dept 540-300-Capital Improvement</b>                    |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Repairs and Improvements      | \$0                 | \$2,660,000                  | \$2,660,000                   |                               |                               | \$2,660,000                               | (\$2,660,000)                                                            |
|                                                            | Other                         | \$0                 | \$530,000                    | \$530,000                     |                               |                               | \$530,000                                 |                                                                          |
| <b>Dept 233-100-Purchasing</b>                             |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            | Wages and Fringes             | \$68,263            | \$0                          | \$29,313                      |                               |                               | \$29,313                                  |                                                                          |
| <b>Dept 253-202-Bad Debt Expense</b>                       |                               |                     |                              |                               |                               |                               |                                           |                                                                          |
|                                                            |                               | \$161,939           | \$0                          | \$0                           |                               |                               | \$0                                       |                                                                          |

|                                                      |                     |                     |                     |                     |                     |                     |
|------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Dept 535.205-Utilities - Water Cross Connection Prog | \$100,318           | \$100,045           | \$105,182           |                     | \$105,182           |                     |
| Dept 545.201-Water Plant Maintenance                 |                     |                     |                     |                     |                     |                     |
| Wages and Fringes                                    | \$1,063,587         | \$1,147,848         | \$1,127,388         |                     | \$1,127,388         |                     |
| Repairs and Improvements                             | \$4,141             | \$28,000            | \$25,000            |                     | \$25,000            | \$25,000            |
| Other                                                | \$430,945           | \$671,289           | \$689,000           |                     | \$689,000           |                     |
| 591-535.125-490.200                                  | \$0                 | \$564,000           | \$564,000           |                     | \$564,000           |                     |
| RWA Operation Payments                               |                     |                     |                     |                     |                     |                     |
| Reserve                                              | \$0                 |                     | \$2,878,750         |                     | \$2,878,750         | \$2,878,750         |
| <b>Total Expenses</b>                                | <b>\$44,210,032</b> | <b>\$37,767,095</b> | <b>\$37,886,000</b> | <b>\$20,265,692</b> | <b>\$58,151,692</b> | <b>\$48,576,942</b> |

| WATER FUND REVENUES          |                   |                     |                     |                     | 2015-16             |                     |             |                     |
|------------------------------|-------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------------|---------------------|
|                              |                   |                     |                     |                     | STATUS QUO          |                     | 2015-16     |                     |
|                              |                   |                     |                     |                     | REVISED             |                     | BUDGET      |                     |
|                              |                   |                     |                     |                     | 2015-16             |                     | CHANGES     |                     |
|                              |                   |                     |                     |                     | BUDGET              |                     | WITH DWSD R |                     |
|                              |                   |                     |                     |                     | 2015-16             |                     | ALL CAPITAL |                     |
|                              |                   |                     |                     |                     | BUDGET              |                     | FUNDING     |                     |
| GE NUMBER                    | DESCRIPTION       | 2013-14             | 2014-15             | 2015-16             | 2015-16             | 2015-16             | Inc.        | Inc.                |
|                              |                   | ACTIVITY            | AMENDED             | APPROVED            | FOR DWSD            | WITH DWSD           |             |                     |
|                              |                   |                     | BUDGET              | BUDGET              |                     |                     |             |                     |
| <b>Revenues - Water Fund</b> |                   |                     |                     |                     |                     |                     |             |                     |
|                              | Meter Water Sales | \$42,132,946        | \$37,000,000        | \$37,000,000        | \$20,265,692        | \$57,265,692        | 55%         | \$48,576,942 31%    |
|                              | Other Revenues    | \$1,589,155         | \$886,000           | \$886,000           | \$0                 | \$886,000           |             | \$886,000           |
|                              | Asset Sale        | \$3,493,743         | \$0                 | \$0                 | \$0                 | \$0                 |             | \$0                 |
|                              | Carry Over        | \$0                 | \$3,263,505         | \$0                 | \$0                 | \$0                 |             | \$0                 |
| <b>Total Revenues</b>        |                   | <b>\$47,215,844</b> | <b>\$41,149,505</b> | <b>\$37,886,000</b> | <b>\$20,265,692</b> | <b>\$58,151,692</b> |             | <b>\$48,576,942</b> |



Benzie, Richard (DEQ)

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**From:** Crooks, Jennifer <crooks.jennifer@epa.gov>  
**Sent:** Wednesday, March 18, 2015 9:53 AM  
**To:** Benzie, Richard (DEQ)  
**Subject:** RE: Information Request and Documentation

**Importance:** High

Hi, Richard. I know you've been in training this week, but I'm wondering if you'd be able to call Tom Poy when you get a minute to discuss this issue below. He understands that you may need to keep some internal discussions under your hat right now, but he wants to touch base with you—He's working on this from EPA end, and wants to provide assistance to you all.

Jen

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**From:** Benzie, Richard (DEQ) [mailto:BENZIER@michigan.gov]  
**Sent:** Thursday, March 12, 2015 6:22 PM  
**To:** Poy, Thomas; Crooks, Jennifer  
**Subject:** FW: Information Request and Documentation  
**Importance:** High

Please treat this information as confidential at this point as I am not sure when and who will bring this matter forward for public knowledge. But I thought you should get a heads up that another problem could become public soon. Liane forwarded the message from Genesee County to our management this morning along with the attached document, but we have not received a response yet. She also contacted the Department of Community Health and they are following up with the County. They told Liane that they have been offering assistance to the county on this matter on several occasions and had not received a response.

Steve and Mike indicated that they were not contacted by the county on this issue as stated in the attachment, so we don't know who they did contact or if they did. We suspect they are escalating the request for information at this time, but we also wonder why they need much of the information they requested from the city to conduct their investigation, which should have been completed by now. Both DEQ and DCH had the same reaction to their statement about the river before they complete their investigation.

Steve, Liane and I will be meeting tomorrow morning to discuss further. We may be meeting with the executive office as well.

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**From:** Benzie, Richard (DEQ)  
**Sent:** Wednesday, March 11, 2015 7:33 PM  
**To:** Shekter Smith, Liane (DEQ)  
**Cc:** Busch, Stephen (DEQ); Prysby, Mike (DEQ)  
**Subject:** RE: Information Request and Documentation

Liane,

Steve's initial response is below.

As I see it, we need a plan of action fast.

- 1) Inform DEQ management, including legislative and media liaisons; suggest additional communication with DCH
- 2) Prepare response to Genesee County email – did anyone in ODWMA or DEQ have any contact with Genesee County about Legionella and if so, when and what? Was anyone in ODWMA or DEQ requested to meet with Genesee County to discuss Legionella and if so, when, and did they “decline” to meet?
- 3) Contact Flint to alert them of County's concerns and determine their response to the January 27<sup>th</sup> FOIA request.
- 4) Arrange for a meeting with Genesee County and other parties as deemed appropriate by DEQ management – DCH, Flint, Governor's Office, etc.; Establish a “Lead” agency but also develop a team approach to move forward and determine an

appropriate, common message as well as when such information should be shared and by whom. Determine how long has Genesee County, DCH, and Flint been aware of the increased cases of Legionella and what the message should be about delays in public notification.

- 5) Determine additional steps – possible monitoring protocols, premise plumbing treatment options, public precautions if any, etc.; Consider possible CDC assistance.
- 6) Determine if EPA will be willing to share their draft Legionella guidance document being developed by a workgroup consisting of EPA, the States of Ohio, Minnesota, Pennsylvania, Washington, Nevada, Missouri and Nebraska, and CDC. The guidance will characterize the effectiveness of treatment technologies to address Legionella and address relevant regulatory implications. The primary implication is that individual customers that install “secondary” treatment systems to remove, reduce or prevent Legionella in their premise plumbing (such as hospitals are already doing) become by federal definition, public water systems required to comply with all applicable requirements of the Safe Drinking Water Act. The guidance has been delayed by internal reviews at EPA, but they are hoping to be able to have a final document in summer of 2015.

That’s all I can think of at this point. Let me know what you think.

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**From:** Busch, Stephen (DEQ)  
**Sent:** Wednesday, March 11, 2015 9:37 AM  
**To:** Prysby, Mike (DEQ); Benzie, Richard (DEQ)  
**Subject:** RE: Information Request and Documentation

Mike,

I am not aware of a meeting request from Jim Henry or the Genesee County Health Department as indicated in his email below. Did you receive any such request?

The FOIA is specifically directed to the City of Flint not the DEQ. If requested some of the information asked for regarding Total Coliform and E.Coli compliance sampling could be provided, but there may also be additional construction repair sampling data.

We can respond to Jim when you get back in, but at this point while the change in source may have created water quality conditions that could provide additional organic nutrient source to support legionella growth, there is no evidence or confirmation of legionella coming directly from the Water Treatment Plant or in the community water supply distribution system at this time.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

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**From:** Prysby, Mike (DEQ)  
**Sent:** Wednesday, March 11, 2015 7:35 AM  
**To:** Busch, Stephen (DEQ); Benzie, Richard (DEQ)  
**Subject:** Fwd: Information Request and Documentation

I am out today and will return tomorrow. Having trouble getting the attachment to open on my phone...but since it appears to be a FOIA regarding Legionella, I felt it is prudent to get this message to you. I will be available tomorrow to discuss or compile any info that we have.

Sent from my iPhone

Begin forwarded message:

## **Busch, Stephen (DEQ)**

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**From:** Busch, Stephen (DEQ)  
**Sent:** Thursday, March 05, 2015 9:39 AM  
**To:** 'Wurfel, Brad (DEQ) (WurfelB@michigan.gov)'  
**Subject:** Tap Filters

Brad,

Regarding point of use and point of entry water filters:

ANSI NSF Standard 42 Covers bacteriostasis, taste and odor (associated only with chlorine removal), and other aesthetic conditions

[http://standards.nsf.org/apps/group\\_public/download.php/19895/NSF\\_42-11%20-%20watermarked.pdf](http://standards.nsf.org/apps/group_public/download.php/19895/NSF_42-11%20-%20watermarked.pdf)

ANSI NSF Standard 53 Covers health effects removal

[http://standards.nsf.org/apps/group\\_public/download.php/19896/NSF\\_53-11a%20-%20watermarked.pdf](http://standards.nsf.org/apps/group_public/download.php/19896/NSF_53-11a%20-%20watermarked.pdf)

It is important to note that the filters are not required to meet all aspects of the standard, only the portions they want to make claims for. So product information for each filter must be reviewed to determine its applicability.

Most of these point of use filters are basic activated carbon filters that simply remove taste and odor specifically associated with chlorine, not other things like iron, manganese, hydrogen sulfide, etc. that can also impact taste and odor as well as color.

It is important to recognize that taste and odor is generally an individual preference and such standards have for the most part not been developed because groups of individuals may still consider taste and odor issues to exist even after levels for such a standard have been met.

Other considerations are that the test water for such filters attempting to meet the standard uses hardness levels of 170 mg/L or less. Flint's water at times may be above this level, which could then impact filter performance and longevity.

Most of these filters are designed to be replaced after 100 gallons or less of use, a period of about 3 months for most households. In addition the tests allow for initial pressure drops of up to 15 psi. This may limit use in households that already rely on minimum pressure within their household plumbing.

Regarding the health effects standards, as the Flint water system already meets such requirements, with the exception of the current TTHM locational running annual average, there is little point to the use of these filters for such a purpose.

If you need additional information or have other questions please let me know.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

## Blood Lead Levels in Flint Talking Points

October 1, 2015

- Initial analysis of MDHHS data found that blood lead levels (BLLs) of children in Flint have followed an expected seasonal trend; due to small numbers further analysis was initiated.
- While this analysis of blood lead levels in Flint as a whole remains true, after a comprehensive and detailed review down to the zip code level, we have found that the state analysis is consistent with that presented by Hurley;
- Director Lyon is working closely with DEQ and the administration to take active steps to reduce all potential lead exposures in Flint, and across the state.
- Our Chief Medical Executive has been in communication with the lead investigator at Hurley Children's Hospital, and we continue to work with Hurley, the city of Flint, local and state leaders to verify and analyze data trends.
- Zip code-level data does show that there has been an increase in elevated childhood blood lead levels in specific communities.
  - This does not conclusively mean that the water source change is the sole cause of the increase, but data does show an association.
  - There is an increased proportion of children with elevated Blood Levels (ELBs) in several zip codes, particularly 03 and -04. These appear to have increased over the last 1.5 years. *There have been* *over 5* *not all*
  - Lead exposure can occur from a number of different sources (such as paint, gasoline, solder, and consumer products) and through different pathways (such as air, food, water, dust, and soil).
  - Although there are several exposure sources, lead-based paint is still the most widespread and dangerous high-dose source of lead exposure for young children in the US and Michigan.
- We reviewed MDHHS statewide data using the same methodology used by Hurley, looking at our numbers by zip code and age ranges, and filtering out non-Flint children.
- Routine surveillance of blood lead levels does not analyze data down to the zip code level. Detailed analysis like this occurs when there is reason to focus in on precise locations or populations.
- MDHHS will be working closely with the Michigan Department of Environmental Quality, Hurley Children's Hospital, the Genesee County Health Department, and community organizations to initiate further action steps.

- We understand that cost may be a barrier to following the recommendations of the local health department. We are actively working with public and private partners to make resources available to those who may need assistance.
- MDHHS is recommending that residents follow the Public Health Advisory issued by the Genesee County Health Department, as well as take further steps to reduce exposures to all forms of lead in and around their homes.

#### *MDHHS Stats and Facts*

- **Data charts/breakdowns and explanations--**
- Lead abatement through MDHHS was federally funded up until FY14 when Michigan began providing additional funds to abate homes.
- In FY14, \$1.25M General Fund was added. In FY15, General Fund was bumped up to \$1.75M and FY16, General Fund remains at \$1.75M.

#### *Reducing and Removing Lead Exposure*

- In housing built before 1978, it can be assumed that the paint has lead unless tests show otherwise.
- Make sure your child does not have access to peeling paint or chewable surfaces painted with lead-based paint.
- Children and pregnant women should not be present in housing built before 1978 that is undergoing renovation. They should not participate in activities that disturb old paint or in cleaning up paint debris after work is completed.
- Create barriers between living/play areas and lead sources. Until environmental clean-up is completed, you should clean and isolate all sources of lead.
  - Close and lock doors to keep children away from chipping or peeling paint on walls. You can also apply temporary barriers such as contact paper or duct tape, to cover holes in walls or to block children's access to other sources of lead.
- Regularly wash children's hands and toys. Hands and toys can become contaminated from household dust or exterior soil. Both are known lead sources.
- Regularly wet-mop floors and wet-wipe window components. Because household dust is a major source of lead, you should wet-mop floors and wet-wipe horizontal surfaces every 2-3 weeks.
  - Windowsills and wells can contain high levels of leaded dust. They should be kept clean. If feasible, windows should be shut to prevent abrasion of painted surfaces or opened from the top sash.
- Take off shoes when entering the house to prevent bringing lead-contaminated soil in from outside.

- Prevent children from playing in bare soil; if possible, provide them with sandboxes. Plant grass on areas of bare soil or cover the soil with grass seed, mulch, or wood chips, if possible.
  - Until the bare soil is covered, move play areas away from bare soil and away from the sides of the house. If you have a sandbox, cover the box when not in use to prevent cats from using it as a litter box. That will help protect children from exposure to animal waste.
- Avoid using makeup, containers, cookware, or tableware to store or cook foods or liquids that are not shown to be lead free.
- Remove recalled toys and toy jewelry immediately from children.
- Use only cold water from the tap for drinking, cooking, and making baby formula. Hot water is more likely to contain higher levels of lead. Most of the lead in household water usually comes from the plumbing in your house, not from the local water supply.
- Shower and change clothes after finishing a task that involves working with lead-based products such as stained glass, making bullets, or using a firing range.

#### *WIC Children*

- There are 855 infants participating in WIC in Flint
- In homes with infants on WIC, if the household has documentation from an official source of unsanitary water supply issues, that family may be eligible to receive ready-to-feed formula. Families should contact WIC to see if they are eligible.
- Each household would have to be looked at on an individual basis.
- WIC cannot cover bottled water.

#### *Background*

- The results of the Hurley Children's Hospital were reviewed by MDHHS after the study was released last week.
- The analysis that Hurley conducted was different from the initial MDHHS data regarding blood lead levels in Flint.
- MDHHS initial data looked at the entire blood lead levels for the Flint area for the past five years and showed the annual seasonal trends in the area.
- Seasonal exposure is higher in the summer for a variety of reasons including children playing outside in the soil, and when windows are open and lead paint is more likely to be in the air. Further, seasonal variations in water can occur due to changes in temperature, pH, and other factors

## Flint Response

- Scope of the KWA project has changed from study *not to clarify* *KWA ok*
- Proposed contracts do not adequately address current and future demands within the City of Flint (DEQ records and Flint RS) *2030 - 2040* *DWSD ok*
  - o Limits opportunity for economic development
- Does not account for differences in raw vs. finished water supply
- Does not account for differences in treatment, Flint River vs. Lake Huron
- By releasing report, Treasury may be subject to lawsuit from Genesee County for interference in competitive bid process and confidentiality of engineer's estimate for future portions of KWA project

*Engineering costs are doubled*  
Detailed breakdown of TYTJ discrepancies can be provided

## KWA Options

- Intake portion of project has been bid and come in significantly below original cost estimates provided by KWA
- Savings from KWA option would be leveraged to make additional improvements to Flint distribution system
- Rowe Engineering response backs concerns over TYTJ study

## DWSD Options

- Options for DWSD to meet full demands for Flint are not cost-effective
- All viable DWSD options would require blending using the Flint River which poses increased public health risks
  - o Increased microbial risk
  - o Increased risk of disinfection byproducts *Increased treatment*
  - o Metals/Mercury? *Line Sludge Disposal*
- Proposals do not include capital and operating cost for Flint WTP *LT2 ESUTR*
- Flint WTP would need to operate continuously at a minimum treatment rate, which may conflict with DWSD contract *Essege*
- Blending sets precedent for other DWSD customers *Quader River*

## Impacts to other communities and resources

- Flint River use impact on downstream NPDES discharges

*Savings would increase \$*  
*Capital under DWSD*  
*Not KWA*

*18, 40, 2*  
*30 Day Max.*

## **Busch, Stephen (DEQ)**

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**From:** Busch, Stephen (DEQ)  
**Sent:** Wednesday, April 17, 2013 9:51 AM  
**To:** Sygo, Jim (DEQ); Shekter Smith, Liane (DEQ); Thelen, Mary Beth (DEQ)  
**Cc:** Shaler, Karen (DEQ); Benzie, Richard (DEQ); Prysby, Mike (DEQ)  
**Subject:** RE: KWA and City of Flint

Director Wyant, Deputy Director Sygo, and Liane,

A response at this point may be moot as Flint and Genesee Co. already held a press conference yesterday rejecting the DWSD offer.

It is also unclear whether DWSD provided its offer directly to Flint and Genesee Co. by the deadline in Treasurer Dillon's letter. However, Flint and Genesee Co. still took the offer under consideration.

Our office concurs with both Flint and Genesee Co. that the offers provided by DWSD were incomplete.

Of the two scenarios provided by DWSD it appeared that only Scenario 2 was listed as potentially being more cost effective. However, this scenario did not address the following:

1. The DWSD scenarios are based on 40 MGD of service capacity. However, the KWA project is providing 60 MGD of initial capacity with potential expansion to 75 MGD in the future. Therefore, in order for a more direct comparison the DWSD scenario would need to increase capacity to 60 MGD, which would increase fixed rate commodity costs as well as the capital costs for the Huron Plant that DWSD was planning to allocate to Flint and Genesee Co., presumably by as much as 50%.
2. DWSD proposals cover a 30 year period to 2042, but fail to recognize that after this period bond payments for the KWA project will be complete and result in a significant reduction in costs for the KWA option.
3. While DWSD indicates that Flint and Genesee Co. would be given "broadened representation", it remains unclear exactly what this means in terms of actual control in the decision making process.
4. This scenario continues to rely on a single transmission system and would require the City of Flint to maintain its WTP for emergency purposes and these costs do not appear to be included. In addition, use of the Flint WTP as an emergency backup would leave Genesee Co. without an adequate backup supply to meet their 30 year needs.

Again, without DWSD providing the specific details of these proposals, it is difficult to provide a true comparative analysis, and as such Flint and Genesee Co. appear to be justified in their rejection of these proposals.

Please let me know if you require any further response.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

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**From:** Sygo, Jim (DEQ)  
**Sent:** Tuesday, April 16, 2013 9:59 AM  
**To:** Busch, Stephen (DEQ); Prysby, Mike (DEQ); Benzie, Richard (DEQ)



✓ **Cc:** Shekter Smith, Liane (DEQ); Shaler, Karen (DEQ); Thelen, Mary Beth (DEQ)

**Subject:** FW: KWA and City of Flint

Steve, Mike and Richard,

Please take a look at DWSD's last best offer to the City of Flint and provide your collective perspective to the Director through Liane by the end of the week. Copy me in as well. I'll be out of the office but would like to know if you think this is worth considering.

Thank you for your expedited review.

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**From:** Wyant, Dan (DEQ)

**Sent:** Tuesday, April 16, 2013 6:52 AM

**To:** Sygo, Jim (DEQ)

**Subject:** FW: KWA and City of Flint

Jim,

Liane is out of the office today, Can you forward this directly to her staff that worked on this with us.

Dan Wyant, Director  
Department of Environmental Quality  
517-373-7917

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**From:** Wyant, Dan (DEQ)

**Sent:** Tuesday, April 16, 2013 6:51 AM

**To:** Sygo, Jim (DEQ); Creal, William (DEQ); Shekter Smith, Liane (DEQ)

**Cc:** Anderson, Madhu (DEQ)

**Subject:** FW: KWA and City of Flint

Bill and Liane,

Can you have your staff's take a quick look at this and let me know today if they think this changes their thoughts and comments to me last week.

Dan Wyant, Director  
Department of Environmental Quality  
517-373-7917

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**From:** Dillon, Andy (Treasury)

**Sent:** Monday, April 15, 2013 7:55 PM

**To:** Wyant, Dan (DEQ); Dennis Muchmore; Roberts, John (GOV)

**Cc:** Stibitz, Brom (Treasury); Saxton, Thomas (Treasury)

**Subject:** Fwd: KWA and City of Flint

FYI

Dan, any thoughts re the attached?

We gave dwsd until today to put best offer on table. Flint is to get back to us tmrw. I want to make sure their expected rejection is made in good faith.

Sent from my iPad

Begin forwarded message

**From:** "Debra Ragland" <[dragland@dwsd.org](mailto:dragland@dwsd.org)>  
**To:** "[ekurtz@cityofflint.com](mailto:ekurtz@cityofflint.com)" <[ekurtz@cityofflint.com](mailto:ekurtz@cityofflint.com)>  
**Cc:** "[jwright@co.geneseee.mi.us](mailto:jwright@co.geneseee.mi.us)" <[jwright@co.geneseee.mi.us](mailto:jwright@co.geneseee.mi.us)>, "Dillon, Andy (Treasury)" <[DillonA2@michigan.gov](mailto:DillonA2@michigan.gov)>, "James Fausone" <[fausone@dwsd.org](mailto:fausone@dwsd.org)>, "[orrk@detroitmi.gov](mailto:orrk@detroitmi.gov)" <[orrk@detroitmi.gov](mailto:orrk@detroitmi.gov)>, "Sue McCormick" <[mccormick@dwsd.org](mailto:mccormick@dwsd.org)>  
**Subject:** KWA and City of Flint

Please see attached on behalf of Sue F. McCormick.

Faxed copy forwarded to Mayor Dayne Walling and Jeff Wright.



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
EXECUTIVE OFFICE  
LANSING

BRIAN CALLEY  
LT. GOVERNOR

**CONTACTS:**

Sara Wurfel or Dave Murray  
Governor's Office: 517-335-6397

Brad Wurfel, 517-284-6713  
Department of Environmental Quality

Jennifer Eisner, 517-230-9804  
Department of Health and Human Services

**FOR IMMEDIATE RELEASE**

Friday, Oct. 2, 2015

## **Gov. Rick Snyder: Comprehensive action plan will help Flint residents address water concerns**

*Collaborative effort with state, federal and city leaders focuses on testing, assistance*

FLINT, Mich. – Flint residents need to have access to safe, clean, water now and long into the future, Gov. Rick Snyder said, announcing a comprehensive action plan created with state, federal and city leaders to address concerns about drinking water.

The water leaving Flint's drinking water system is safe to drink, but some families with lead plumbing in their homes or service connections could experience higher levels of lead in the water that comes out of their faucets.

The action plan focuses on increasing water testing, offering additional precautions for families with lead plumbing in their homes, and providing long-term solutions to address the city's water infrastructure challenges. The plan was created at Snyder's direction by the Michigan Departments of Environmental Quality (DEQ) and Health and Human Services (DHHS), the U.S. Environmental Protection Agency, and the city of Flint.

"We are focused on helping ensure safe, clean, accessible drinking water and addressing and mitigating concerns and protecting public health," Snyder said. "Today's action plan builds upon ongoing work with local, state and federal agencies and our partnership with city and community leaders. Together, we are working to ensure that all Flint residents have accurate information and know that help is available to address potential problems."

The city and the state also are working together to gather more data to ensure the water that leaves the treatment plant as well as the water that arrives in Flint homes is safe for all residents. The plan includes:

- Testing in Flint public schools immediately to ensure that drinking water is safe, with testing also available at no cost to any other school in Flint.
- Offering free water testing to Flint residents to assure their drinking water is safe.

- Providing free water filters to residents.
- Expanding health exposure testing of individual homes.
- Accelerating corrosion controls in the Flint drinking water system.
- Accelerating water system improvements to address replacing lead service lines.
- Expediting the completion of the Karegnondi Water Authority pipeline.
- Expanding a Safe Drinking Water Technical Advisory Committee to ensure the best technology, practices and science are being followed by adding an expert from the Environmental Protection Agency's Office of Research and Development to the group.
- Naming Dr. Eden Wells, chief medical executive for the Michigan Department of Health and Human Services, as the Flint drinking water public health adviser.
- Boosting a comprehensive lead education program to make sure residents have detailed information about how to protect themselves and their homes.

Residents can have their water tested by calling 810-787-6537 and pressing 1, or emailing [flintwater@cityofflint.com](mailto:flintwater@cityofflint.com). The DEQ is covering the cost of this testing.

State leaders have been working closely with state and federal lawmakers to tap resources at all levels of government to address concerns:

State health experts said there has been an increase in elevated childhood blood lead levels in some specific communities. Initial analysis of MDHHS data found that blood lead levels of children in Flint have followed an expected seasonal trend. While this analysis for Flint as a whole remains true, a comprehensive and detailed review breaking down data by ZIP codes with the city revealed that MDHHS data is consistent with a study presented recently by Hurley Children's Hospital.

"While we cannot conclusively say that the water source change is the sole cause of the increase, this analysis supports our efforts as we take active steps to reduce all potential lead exposures in Flint," MDHHS Director Nick Lyon said. "As part of this, we are working closely with our public and private partners to provide Flint residents on MDHHS assistance programs with free water filters and inform families about the steps they can take to reduce all lead exposures in their home."

As a part of the action plan, National Sanitation Foundation certified water filters will be made available to Flint residents through emergency state funds and coordinated efforts with local community agencies and donors. Information about how to obtain the filters will soon be available.

"This action plan offers concrete steps we will take in a local, state and federal partnership to ensure all Flint residents have safe water to drink," DEQ Director Dan Wyant said, "The DEQ will work closely with the city to gather further data to ensure the water that leaves Flint's system as well as the water that arrives in Flint homes is safe to drink."

Additional information is available at [www.michigan.gov/flintwater](http://www.michigan.gov/flintwater).

###



STATE OF MICHIGAN

September 10, 2015

Michigan Department of Environmental Quality  
Executive Division  
DEQ Director: Dan Wyant  
P.O. Box 30473  
Lansing, MI 48909-7973

Director Wyant,

In light of recently released findings by the American Civil Liberties Union, independent researchers and a troubling interim U.S. Environmental Protection Agency memo from June, we are requesting additional answers about the safety and treatment of the City of Flint's water.

Several disturbing points have been raised and we have a number of urgent questions, including:

1. • When did the MDEQ become aware of the June 24, 2015, interim EPA memo and whom was it shared with?
  - A • Which Flint city officials also received this information?
  - B • Why was the memo not immediately shared with the public?
  - C • What response did MDEQ have to the EPA concerns raised in the memo?
  - D • Were any actions taken by the MDEQ as a result of the issues mentioned in the memo?
  - E • What steps, if any, were taken to determine the validity of the Virginia Tech study?
2. • Please explain why the pre-flushing method of sampling was used in this instance.
  - A • Is it the same method that is applied to all sampling or does the agency have the discretion to decide?
  - B • Who is responsible for making the decision to pre-flush?
  - C • The EPA memo references the Lead Copper Rule requirement that systems greater than 50,000 users maintain "corrosion control treatment." As the regulator, why did the MDEQ choose not to enforce that standard?
  - D • The EPA recommends allowing water to rest for at least six hours, but no more than 12 hours, before taking a sample. On MDEQ's Web site, it suggests flushing the line for five minutes before the six-hour rest. How did the department arrive at this method?
- According to a July 9, 2015, article on DeadlineDetroit.com, "Scary: Leaded Water and One Flint Family's Toxic Nightmare,"

*"The EPA offered Flint officials the use of agency experts to help get the situation under control," said Del Toral, but added that, to his knowledge, the city has so far declined all help.*

*LeeAnne Walters said that when she asked why city officials weren't taking the EPA's offer of assistance, she was told, "We don't need it."*



STATE OF MICHIGAN

*Flint spokesman Lorenz, on the other hand, maintained "the city continues to work closely with the MDEQ and the EPA Regional Office."*

- E • Who refused the EPA's offer of expert assistance and why?
- 3 A • Is the damage done to the pipes (as described in the EPA report) accurate?
- B • If yes, will damaged pipes continue to leach lead or will properly treated water safely reach consumers?
- What is the plan and timeline to address it?
- 4 • And most importantly, what can be done immediately to ensure safe, affordable drinking water for the citizens of Flint?

Many of the decisions that led to the current situation occurred while a state-appointed manager was in control and MDEQ personnel were consulted about testing methods and how to address the situation. In addition, MDEQ also encouraged the method of water testing used by Flint officials. We believe that there is a heightened obligation by the state to make this right.

Due to the serious public health threats of this situation, we respectfully request a response to these matters by Monday, September 14, 2015.

We will do our best to accommodate meeting requests, if necessary, but would appreciate written responses to the above questions so that we can make informed decisions swiftly to address these serious concerns.

Sincerely,

Jim Ananich  
Senate Democratic Leader  
District 27

Sheldon Neeley  
State Representative  
District 34

Phil Phelps  
State Representative  
District 49

cc:  
U.S. Representative Dan Kildee  
Mayor Dayne Walling, City of Flint  
Howard Croft, City of Flint  
Susan Hedman, EPA  
Thomas Poy, EPA  
Michael Schock, EPA-ORD  
Darren Lytle, EPA-ORD  
Denise Fortin, EPA  
Liane Shekter-Smith, MDEQ  
Pat Cook, MDEQ  
Stephen Busch, MDEQ  
Brad Wurfel, MDEQ  
Marc Edwards, Virginia Tech

# Flint WTP

- Softening last Done 2007
- Old Lime Equip. Cleaned + Prepped
- Westech - Slake Std. Ops + Startup Procedures
- Plant Run July 8?
  - 4 weeks @ 18 MGD
  - 1st week No Softening
  - 2-4 softening based on outfall
- Need to get softening chemical approvals
- Sludge Disposal Holding Tank
- IP comingful DWSD extra monitoring?

Theoretical vs. Actual Appl. Load  
Bottleneck

Recarb. outfall to filter, but at 30 MGD  
Non-Softening can use additional chemicals

Granite in River

Softening Only - Carbonate only < 150  
Sludge

@ 14 MGD \$20,000 gal/wk  
w/Non-Carb. → @ 55% (Pressed) 13,000 gal/wk 260 tons



J&T Tech (PA)

4 reduced sludge units

60 tons/day each

leave to City

- No Cl into Raw water - for Ozone

Entry Elev 70.25 Floor of Ozone

747.42 Water Level Elevation

The - in for Raw Water Line

14 days Storage on GCD

Treatment Goals

No River Zebra Mussel Control

- Extra Operator for Softening

- In-house Oper. Work force



HgW/- LAN Warren Green

- Rowe Jim Redding
- Residuals Solids Handling Plan
- 30 day supply

Coagulant Pilot?

↳ Alum? Dry / Lig?

Electrical

Dual Feed vs Generator

Settled Water Cl Feed

Filter Press Rental / Lease

C&T

↳ Ozone 15' Stage Sample Tap

- UV Pipex for Potable

Mtg w/ Flint + OWMRP

1/24/2014

- No NPDES Discharge

if 30% solids  
need 60,000 yd<sup>3</sup> + 23 ft precast

Mon. Wells

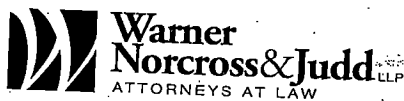
4 existing on East side  
2 added to West side

2 additional in middle were not found due to rubble cover

- NaCl + Mich ID sample analysis  
VOC?

sent to City sanitary sewer

Michael L. Robinson



Warner Norcross & Judd LLP  
900 Fifth Third Center  
111 Lyon Street, N.W.  
Grand Rapids, Michigan 49503-2487  
[www.wnj.com](http://www.wnj.com)

616.752.2128  
Cell 616.481.2662  
Fax 616.222.2128  
[mrobinson@wnj.com](mailto:mrobinson@wnj.com)

Filter Plug - Lime

- Filter Shut down → NPDES Discharge

→ Sludge + Discharge to Bay Pl.

- Filter Run?

- Bay Pl. Storm Water

→ Chris + Stephanie ←

LAN

- Electrical

- Out Feed in house transformer + sub  
Cost from consumers

# FLINT WTP FACILITY MEETING AGENDA

June 26, 2013

9:00 am

## Discussion Topics

- I. Introductions
- II. Progress Update
  - A. Regulatory Needs for Interim & Long Term Operation
  - B. Scheduled Plant Run
  - C. Timing
  - D. Softening/Sludge Disposal
- III. Existing WTP Facility Anticipated Improvements
  - A. Plant Capacity/Hydraulics
  - B. Short Term Goal-Flint River
  - C. Long Term Goal-KWA
  - D. Project Costs/Budgets
    - 1. City
      - a) Test Run Mode
      - b) Flint River
      - c) KWA
    - 2. County
      - a) Test Run Mode
      - b) Flint River
      - c) KWA
- IV. Operational Considerations
  - A. Job Duties
  - B. Work Sharing
  - C. Operational/Product/Utility Costs
- V. Other Issues
- VI. Meeting Schedule



- Construction Schedule for Plant
- Disposal Option  $\rightarrow$  setting
- Monitoring Requirements incl. optimum corrosion control treatment
- Operational Plan
  - $\rightarrow$  limited # of provisional cert

Met w/ Flint Env  
Nov. 18? Approval from Treasury  
Flint - permit app

working on permit app for WTP upgrades

↳ 1 WTP needs for normal cap + treat

↳ 1 Softening including disposal

↳ Improve ~~and~~ redevelopment of  
Bryant Road

Discharge to Sanitary (No WRD)

Disposal of Redeveloped Area

Separately

Met w/ Liz + Dir?

817-384-6543

- Timeline + Scope Revised
- Same End Dates
- 80% Copy to state

- Last Material Back to Plant #1  
Line Bulkhead

- Lagoon Basin Defined but needs interior Maintenance

Sludge Pumps go directly to pipeline to Bay Road

Contact Byron Lane on Flint Dam Issues



EM Mtg

Rowe

- RS Finalize → Recommend Improve

- Capital Improvement Plan

- WTP

↳ KWA

↳ Softening

- Questions

None

- Assistance

All Done

↓  
Low Pressure Area

↓  
Transmission Improv.

- Blight Reduction/Condition Improv.

- Bids to Treasury

- Dam Capital Improvement as part of River

- Bray Road Long Term

CITY OF DETROIT  
WATER AND SEWERAGE DEPARTMENT  
OFFICE OF THE DIRECTOR

735 RANDOLPH STREET  
DETROIT, MICHIGAN 48226-2830  
WWW.DETROITMI.GOV

January 12, 2015

Mr. Darrell Earley, Emergency Manager  
Mr. Dayne Walling, Mayor  
City of Flint  
1101 S. Saginaw Street  
Flint, Michigan 48502

Dear Messrs. Earley and Walling:

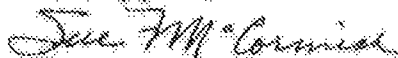
Regarding: Re-establishing Detroit Water and Sewerage Department Water Service

I was recently referred to a report in MLive in which there was reference to the City of Flint (City) potentially re-visiting its decision to utilize Flint River water as a water source prior to the completion of the KWA pipeline. Within that report, there appeared to be some incorrect assumptions about the cost of water service from the Detroit Water and Sewerage Department (DWSD). I write to you today to express the willingness of DWSD to resume delivery of drinking water to the City and its residents. We have monitored the water quality issues that have troubled the City since May, 2014, and understand that many of the difficulties stem from the limited access to source water. Please know that DWSD is ready, willing and able to resume service to the City if you so desire.

If the City is interested in a long term arrangement with DWSD, with this goal in mind, we offer that the City can immediately reconnect to the DWSD system at no additional charge to the City and at the same "expired contract" rate that the City was paying in April, 2014, modified to reflect the 4% increase experienced by all other wholesale customers in July, 2014. The resulting rate structure is a fixed monthly rate of \$846,700 and a commodity rate of \$14.92/Mcf. In order to facilitate contract negotiations, DWSD is willing to extend this rate to the City (and to Genesee County as the City's partner and former customer) until June 30, 2015.

We at DWSD take very seriously the matter of drinking water quality, and we are as concerned as you must be by the continued quality issues faced by the City. We are confident that DWSD can provide you with a solution for reliable, safe, high quality water on an expeditious timeline. Please contact me directly at (313) 224-4701 if you wish to discuss this offer further.

Sincerely yours,



Sue F. McCormick  
Director

cc: Governor Rick Snyder -- (via U.S. Mail)  
Flint City Council, (via U.S. Mail and Electronic Mail)  
Eric Mays; Jacqueline Poplar (c/o Jennie Johnson); Kerry Nelson (c/o Jennie Johnson); Joshua Freeman;  
Wartwaz Davis; Herbert Winfrey (c/o Jennie Johnson); Monica Galloway; Vicki VanBuren; Scott  
Kincaid (c/o Jennie Johnson)  
Jeff Wright, QCDC -- (via Electronic Mail)  
Mayor Mike Duggan (via Electronic Mail)  
James Fausone, BOWC (via Electronic Mail)  
Robert Daddow, GLWA (via Electronic Mail)

## **Busch, Stephen (DEQ)**

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Wednesday, March 27, 2013 1:39 PM  
**To:** Thelen, Mary Beth (DEQ); Wyant, Dan (DEQ); Sygo, Jim (DEQ); Shekter Smith, Liane (DEQ)  
**Cc:** Willard, Veronica (DEQ); 'Richard Benzie P.E. (BENZIER@michigan.gov)'; prysbym@michigan.gov; 'Jon Bloemker P.E. (BLOEMKERJ@michigan.gov)'; Donaldson, Kristina (DEQ); Creal, William (DEQ)  
**Subject:** ODWMA Response - Flint KWA-DWSD Report  
**Attachments:** deq-wb-dwehs-wwciu-gcdclqwwpermitresponsepubliccomment\_290345\_7.pdf; Rowe Review of Tucker Young Report.pdf

**Importance:** High

Director Wyant, and Deputy Director Sygo,

Addendums to ODWMA comments provided yesterday regarding the City of Flint water system and comments on the reports from Tucker, Young, Jackson, Tull, Inc. (TYJT) can be found below in red. Additional comments are as follows:

With regards to regulatory authority for DEQ to allow or prevent the breakup of water utilities, and State vs. local decisions about cost effectiveness, it is important to note that when the DEQ permitted the water withdrawal for KWA (permit 2009-001) part of the decision making process (copy attached) included reasonable use and the balance of Economic Development, Social Development, and Environmental Protection. As part of the public participation process general comments were received (pages 6 & 7) regarding impacts on DWSD and rates to remaining customers. The Department's response to those comments stated:

"The DEQ is specifically precluded from using part 327 to "...diminish or create any existing authority of municipalities to require persons to connect to municipal water supply systems as authorized by law" (MCL 324.32726)."

And

"It is appropriately an issue for water service contract negotiations between the regional water system and its customers. To do otherwise invites unwanted intervention of the state into local decision making."

ODWMA cannot on its own assess an actual dollar value to any regional benefit for the City of Flint to remain a full customer of DWSD, but the following should be included in any additional analysis:

- The cost estimates provided in the TYJT report show a cost difference between full KWA and full DWSD participation of \$172 million over 30 years.
- The formation of KWA would itself be considered one of the largest regional drinking water authorities in the State in terms of capacity, and as such any regional benefits provided by DWSD may only be marginal in comparison.

Finally, we have additional questions for TYJT regarding the various DWSD supply options and the considerations they made in the operations of the Flint WTP. These considerations will have an impact on the cost estimates for DWSD options.

We look forward to further discussion of these comments during our meetings tomorrow, and please let us know if you have any additional questions for us between now and then.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 3:58 PM  
**To:** Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)  
**Cc:** Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** RE: Flint Draft Response

I will provide additional follow up by tomorrow (Wed.) afternoon to my previous email below based on our discussion and the conference call with Andy Dillon earlier today.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

---

**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 12:37 PM  
**To:** Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)  
**Cc:** Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.
2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
  - a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, without the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).
  - b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).
3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.
4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
  - a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)

- b. Pose an increased risk of disinfection by-product (carcinogen) exposure to public health (Flint River vs. Lake Huron source water)
  - c. Trigger additional regulatory requirements under the Michigan Safe Drinking Water Act (LT2ESWTR)
  - d. Require significant enhancements to treatment at the Flint WTP, beyond those identified in the TYJT report (see item 5 below).
  - e. Water Resource Division is evaluating potential impacts to NPDES wastewater discharge permits in downstream segments of the Flint River, as a result of decreased river baseflow caused by Flint WTP use.
5. The TYJT report does not adequately address increased requirements and costs associated with using the Flint River as a significant source for the Flint WTP, which are not necessary under a Lake Huron source water scenario. This includes:
  - a. The need to provide softening treatment
  - b. Limitations on disposal options for lime softening sludge
  - c. Increased ozone capacity, UV disinfection
  - d. Additional backup power, more power required for Flint River operation
6. The Flint WTP must operate at some minimum level and within a range of flow rates to maintain treatment effectiveness. Currently that minimum level is 9 MGD. This level may be reduced with additional capital costs to modify the WTP, not addressed in the TYJT report.
7. Allowing Flint WTP to blend water with DWSD sets a new precedent that could pose future consequences with other DWSD customers.
8. Costs impacts to remaining DWSD customers would be similar under the proposed scenarios, only retaining 8 MGD of 30+ MGD total Flint/Genesee Co. demands, based on the following:
  - a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
  - b. Flint's need to utilize the Flint River as a source
9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits. The KWA water withdrawal permit (2009-001) includes the required implementation of conservation measures that would also drive these distribution system improvements.
10. Major cost discrepancies in TYJT analysis
  - a. Engineering, Legal, Administration, Contingency – TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
  - b. Pumping facilities – TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.
11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA, if they remain with DWSD. However, indications to ODWMA are that these communities are currently in final negotiations with KWA for service, which would make this a non-issue.
  - a. City Lapeer
  - b. City of Imlay City

Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz. (Copy Attached)

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

No Cedar St. Inspection

- West Reservoir →

- Cedar St →

Cl added going in ✓  
Monitor Cl & suction well

✓ #5 area pos

✓ 8/12 - site

✓ 8/13 all 3

✓ 8/14 site

✓ 8/15 site

8/16 up?

Routine Sites Sampling  
tomorrow 8/19

→ - 3 today NO so far

Bk sample site  
X-conn

Cl equip. plugged @  
Reservoir

- Flush Fri, Sat, Sun.  
+ City wide starting  
tomorrow 8/19

## LABORATORY SERVICES

- ◊ EST HOME
- ▼ Bacteria
  - ◊ Legionella
  - ◊ Legionella Rush
  - ◊ Legionella PCR
  - ◊ MRSA
  - ◊ Pseudomonas aeruginosa screen
  - ◊ Sewage Contamination Screen
  - ◊ Air Samples (Bacteria)
  - ◊ Surface Samples (Bacteria)
- ▼ Fungal
  - ◊ Air Samples (Fungi)
  - ◊ Surface Samples (Fungi)
- ▼ Microbial Corrosion
  - ◊ Acid Producing Bacteria
  - ◊ Algae
  - ◊ Denitrifying Bacteria
  - ◊ Fluorescent Pseudomonads
  - ◊ Iron Related Bacteria
  - ◊ Nitrifying Bacteria
  - ◊ Slime Forming Bacteria
  - ◊ Sulfate Reducing Bacteria

[Home » Bacteria](#)

## LEGIONELLA

**L001 - Legionella Culture & Direct Fluorescent Antibody (DFA)**

This test provides a total heterotrophic bacterial count and identification of *Legionella* bacteria, both viable (via culture) and nonviable (via DFA). A screen for *Pseudomonas aeruginosa* is included free for all decorative fountain, whirlpool, spa, and swimming pool samples.

**Turnaround: 7-10 days****Notification:** Email of Risk Summary, Report, & Recommendations

\$95/sample

**Method\***

"Gold Standard" CDC approved testing procedure for the isolation and confirmation of *Legionella* bacteria in environmental samples (water or swab)  
Aerobic Heterotrophic plate count

**Sample Analysis**

Viable *Legionella* detection and confirmation as being:

1. *Legionella pneumophila* Serogroup 1
2. *Legionella pneumophila* Serogroup 2-14
3. *Legionella* Species

DFA Analysis - Indicating presence of living and/or dead *Legionella* at test site

(indicating site history)

*Legionella* - Total Bacteria Ratio

(another assessment of resistance to current biocide treatment)

**Legionella Confirmation**

*Legionella* isolates confirmed by direct monoclonal antibody stain

**Laboratory Report** Interpretations and Recommendations Provided**Limit of Sensitivity**

&lt;1 CFU/ml for potable water samples

10 CFU/ml for cooling tower samples

20 CFU/ml for swab samples

**Additional Analysis**

(CFU - Colony Forming Unit)  
Samples may also be analyzed for other bacteria such as *Pseudomonas aeruginosa* screen or Microbial Corrosion Screen

**Supplementary Legionella Tests:****L002 - Legionella Direct Fluorescent Antibody (DFA)**

This test provides quantification of both viable and nonviable *Legionella* bacteria from a sample.

**7-10 days**

\$40/sample

## COMPREHENSIVE LEGIONELLA SERVICES

## CHAIN OF CUSTODY

**Download:**  
Chain of Custody

## LAB NEWS

No Current News



- On site testing (including emergency response)
- Development of test kits and training (for self-testing if desired)
- Complete laboratory analysis
- Personalized risk assessments
- *Legionella* Management Plan
- PhD Microbiologist Recommendations

***Environmental Safety Technologies, Inc***

1815 Brownsboro Road, Louisville, Kentucky 40206

1/22/2014

called 8:30

Sue McCormick

- German Co. Ink up

- Flint

↳ Water Quality

## **Busch, Stephen (DEQ)**

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**From:** Busch, Stephen (DEQ)  
**Sent:** Tuesday, March 26, 2013 12:37 PM  
**To:** Wyant, Dan (DEQ); Thelen, Mary Beth (DEQ); Sygo, Jim (DEQ)  
**Cc:** Willard, Veronica (DEQ); Shekter Smith, Liane (DEQ)  
**Subject:** Flint Draft Response

Director Wyant,

In preparation for our call today with Treasurer Dillon's office, ODWMA has developed the following for consideration. We can provide any additional info you require during the meeting.

ODWMA has reviewed the materials developed by the consultant Tucker, Young, Jackson, Tull, Inc. (TYJT) for Treasury regarding the City of Flint and potential alternatives for public water supply. Based on our reviews, we have developed the following comments to this point in our analysis:

1. The TYJT report does not contain the full scope of the Karegnondi Water Authority (KWA) raw water supply system. TYJT concerns over raw water supply redundancy and reliability are addressed to the satisfaction of ODWMA under the full KWA proposal. Please note some portions of the overall project are being financed independently by the Genesee County Drain Commission.
2. There are significant differences in contract language between KWA and Detroit Water and Sewerage Department (DWSD) with respect to the contracted maximum day demand capacity.
  - a. Under a KWA contract, a "maximum day" capacity of 18 million gallons per day (MGD) would fully satisfy current demands of the City of Flint, without the need to supplement raw water capacity using the Flint River. (18 MGD, average over a 30 day period).
  - b. Under a DWSD model contract, a "maximum day" capacity, even at 18 MGD, would not satisfy the current demands for the City of Flint. (18 MGD, over any 24 hour period).
3. Restrictions in contracted capacity that would prevent the City of Flint from meeting peak demand requirements present potential limits to economic development within the City of Flint, including possible connection bans and water system extension bans. This information was previously conveyed to the City of Flint by ODWMA staff.
4. All contract options with DWSD that are considered semi-competitive with the KWA contract do not fully supply the City of Flint, and would require the City of Flint to meet a significant, if not majority, of its water demands by treating water from the Flint River. Continuous use of the Flint River at such demand rates would:
  - a. Pose an increased microbial risk to public health (Flint River vs. Lake Huron source water)
  - b. Pose an increased risk of disinfection by-product (carcinogen) exposure to public health (Flint River vs. Lake Huron source water)
  - c. Trigger additional regulatory requirements under the Michigan Safe Drinking Water Act (LT2ESWTR)
  - d. Require significant enhancements to treatment at the Flint WTP, beyond those identified in the TYJT report (see item X below).
  - e. Water Resource Division is evaluating potential impacts to NPDES wastewater discharge permits in downstream segments of the Flint River.
5. The TYJT report does not adequately address increased requirements and costs associated with using the Flint River as a significant source for the Flint WTP, which are not necessary under a Lake Huron source water scenario. This includes:
  - a. The need to provide softening treatment
  - b. Limitations on disposal options for lime softening sludge

- c. Increased ozone capacity, UV disinfection
  - d. Additional backup power, more power required for Flint River operation
6. The Flint WTP must operate at some minimum level and within a range of flow rates to maintain treatment effectiveness. Currently that minimum level is 9 MGD. This level may be reduced with additional capital costs to modify the WTP, not addressed in the TYJT report.
7. Allowing Flint WTP to blend water with DWSD sets a new precedent that could pose future consequences with other DWSD customers.
8. Costs impacts to remaining DWSD customers would be similar under the proposed scenarios, only retaining 8 MGD of 30+ MGD total Flint/Genesee Co. demands, based on the following:
- a. Genesee County distribution system demands are pulling out of DWSD regardless of the decisions by Flint WTP
  - b. Flint's need to utilize the Flint River as a source
9. ODWMA anticipates cost savings under the KWA proposal will be leveraged to provide additional improvements to the City of Flint water distribution system, improving efficiency and providing additional cost benefits.
10. Major cost discrepancies in TYJT analysis
- a. Engineering, Legal, Administration, Contingency – TYJT appears to have effectively double charged for these costs in their KWA estimates without adequate justification
  - b. Pumping facilities – TYJT cost estimate methodology does not appear to address localized market costs and does not distinguish fixed and variable costs in its comparison analysis.
11. Remaining DWSD customers in Lapeer County could potentially see water quality impacts as a result of Flint joining KWA.
- a. City Lapeer
  - b. City of Imlay City
- would still be present if Flint uses only 8 MGD*

Additional response to the TYJT report has also been provided by Rowe Engineering to Flint EFM, Mr. Ed Kurtz.

ODWMA has continued to meet on a regular basis with KWA, Genesee County, and the City of Flint regarding these water supply proposals.

ODWMA will continue to provide any additional detailed analysis requested by Treasury or the DEQ Executive Office.

Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
MDEQ  
517-643-2314

KWA  
1/23  
2/11  
Flint  
3/25

# Report 8: Epi-Curve Graph

Time Period: 01/01/2012 - 01/16/2015

County: Genesee

Time Breakdown: by Month

Reportable Condition: Legionellosis

Case Types: Individual and Aggregate

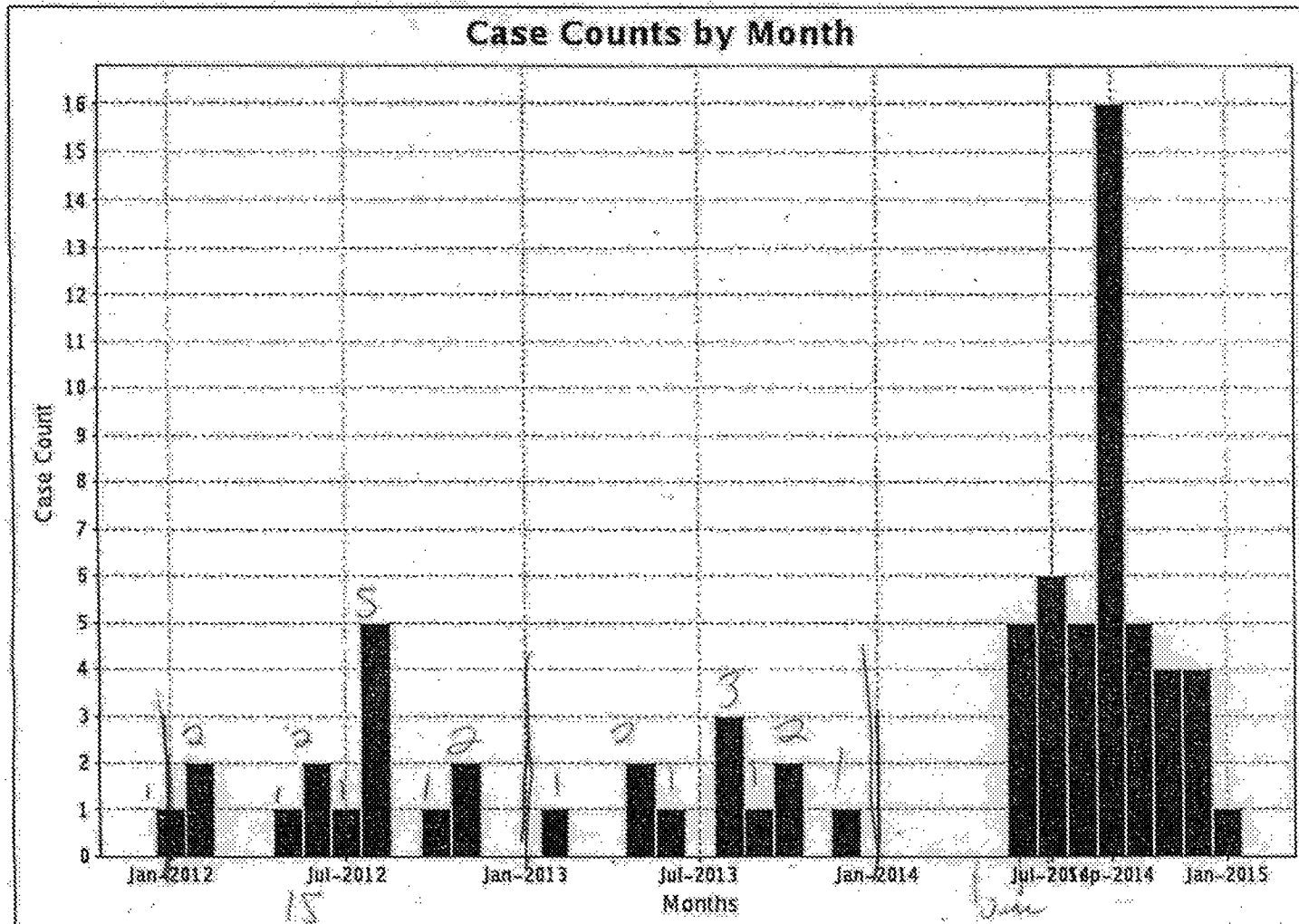
Case Status: Confirmed, Confirmed-Non Resident, Not

a Case, Probable, Suspect, Unknown

Investigation Status: Active, Canceled, Completed,

Completed - Follow Up, New, Review, Superseded

## Case Counts by Month



| Month    | Total |
|----------|-------|
| JAN 2012 | 1     |
| FEB 2012 | 2     |
| MAY 2012 | 1     |
| JUN 2012 | 2     |
| JUL 2012 | 1     |
| AUG 2012 | 5     |
| OCT 2012 | 1     |
| NOV 2012 | 2     |
| FEB 2013 | 1     |
| MAY 2013 | 2     |
| JUN 2013 | 1     |
| AUG 2013 | 3     |
| SEP 2013 | 1     |
| OCT 2013 | 2     |
| DEC 2013 | 1     |
| JUN 2014 | 5     |
| JUL 2014 | 6     |
| AUG 2014 | 5     |
| SEP 2014 | 16    |
| OCT 2014 | 5     |

| Month    | Total |
|----------|-------|
| NOV 2014 | 4     |
| DEC 2014 | 4     |
| JAN 2015 | 1     |

2012 - 15

2013 11

2014 46

CONFIDENTIAL - INFORMATION  
NOT TO BE RELEASED  
EXCLUDED BY NCL 331.555  
40-20175, 333.21513  
A. 331.555, 333.21513 & 333.21514

## Report 8: Epi-Curve Graph

Time Period: 01/01/2010 - 04/14/2015

Time Breakdown: by Month

Reportable Condition: Legionellosis

Case Status: Confirmed, Probable, Suspect, Unknown

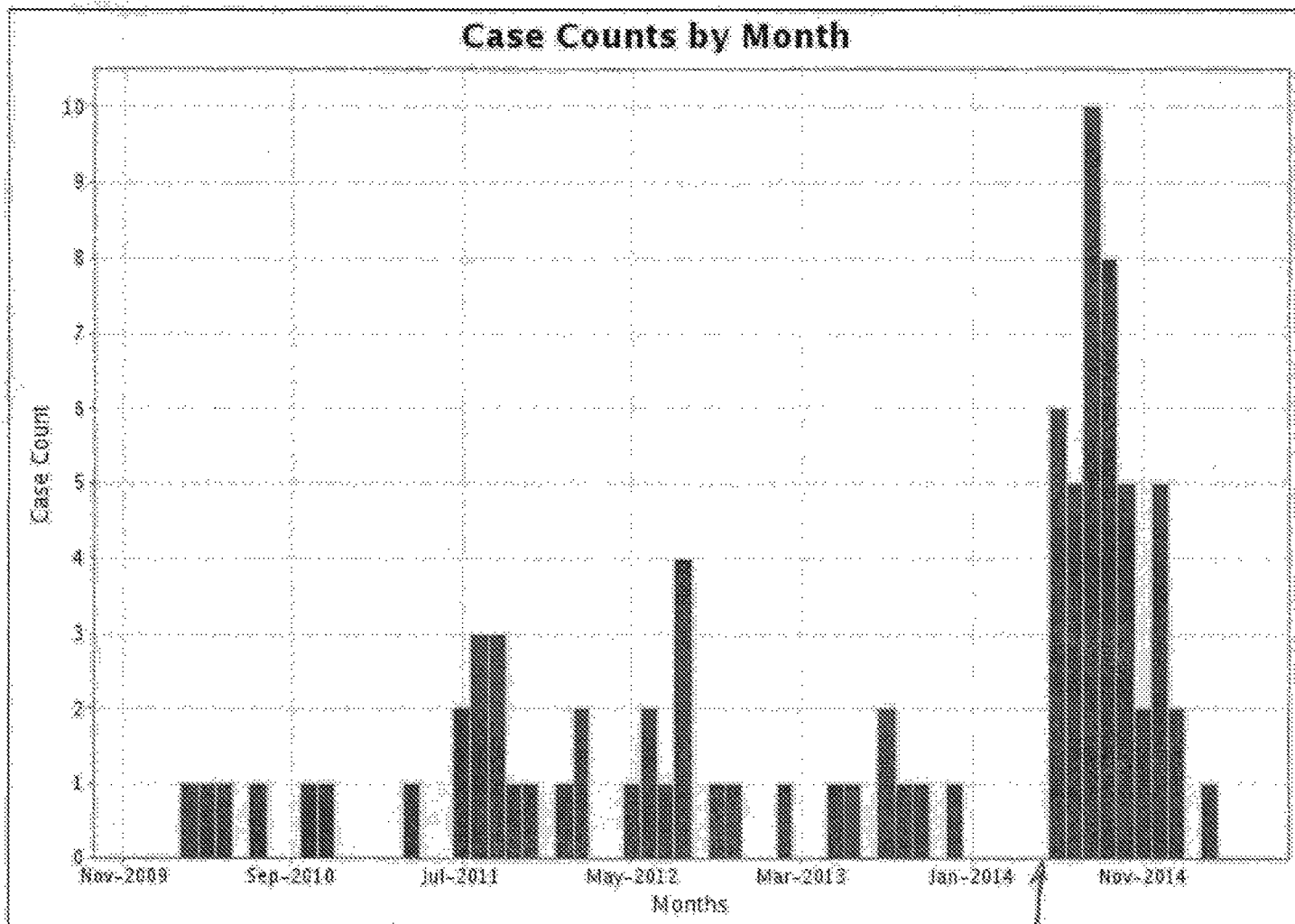
Investigation Status: Active, Completed, Completed -

Follow Up, New, Review

Jurisdictions:

Genesee County

Case Types: Individual and Aggregate



| Month    | Total |
|----------|-------|
| MAR 2010 | 1     |
| APR 2010 | 1     |
| MAY 2010 | 1     |
| JUL 2010 | 1     |
| OCT 2010 | 1     |
| NOV 2010 | 1     |
| APR 2011 | 1     |
| JUL 2011 | 2     |
| AUG 2011 | 3     |
| SEP 2011 | 3     |
| OCT 2011 | 1     |
| NOV 2011 | 1     |
| JAN 2012 | 1     |
| FEB 2012 | 2     |
| MAY 2012 | 1     |
| JUN 2012 | 2     |
| JUL 2012 | 1     |
| AUG 2012 | 4     |
| OCT 2012 | 1     |
| NOV 2012 | 1     |

| Month    | Total |
|----------|-------|
| FEB 2013 | 1     |
| MAY 2013 | 1     |
| JUN 2013 | 1     |
| AUG 2013 | 2     |
| SEP 2013 | 1     |
| OCT 2013 | 1     |
| DEC 2013 | 1     |
| JUN 2014 | 6     |
| JUL 2014 | 5     |
| AUG 2014 | 10    |
| SEP 2014 | 8     |
| OCT 2014 | 5     |
| NOV 2014 | 2     |
| DEC 2014 | 5     |
| JAN 2015 | 2     |
| MAR 2015 | 1     |

## Comments Re Corrosion Control

1. Establish Phosphoric Acid dose at no less than 1.0 mg/l as P (3.2 mg/l as  $\text{PO}_4$ )
2. Dose  $\text{PO}_4$  Product at a rate  $> 1.0 \text{ mg/l as P}$  <sup>AS needed</sup> to establish minimum. ~~of~~ distribution residuals at 1.0 mg/l as P (3.2 mg/l as  $\text{PO}_4$ )
3. Re-establish WQP monitoring at the 25 locations previously used when on Detroit water. IN addition to monitoring for the parameters called out in the LCR, include the parameters for turbidity, iron, & chlorine
4. Conduct JAR test at proposed dosage to verify optimal pH range is maintained
5. Provide Product cut-sheet showing MAX. dosage and NSF Std. 60 certification

## Time line since August 17, 2015

- 
- 
- 10/28 Issued 10/28 Permit
- ✓ 10/30 Letter on COT operations →
- 11/9 Letter Compliance Communication
- 
- April 24 no corrosion inhibitor in place
- 6/30
- 7/21 corrosion treatment EPA
- 
- 8/17 LCR
- 10/16 connected to DWSD
- 10/28 Permit issued
- 12/9 PO4 boost

---

- example from

Mel Brown 45



3/12/15 - FNT Briefing <sup>with Steve</sup>  
DANNA, MARK Dwyer

Expanded of FOIA to City from GCHO  
discussed Grant & credit

~~but the process~~ need to transfer City on WFP opt/pending

3/31/15 - Email from Crooks - MFP/Bush  
Ref. Call w/ EPA COW/ office of Research

4/2 - FOIA from GCHO to FNT

4/23 Email from H. Kraft - GCHO - CC MFP

4/1/15 DCH/LHD/DEQ call  
- L cases

4/14/15 DEQ - DHS Internal meeting  
- System Anomalies? Blocks?  
- Data parameters  
- Risk Assess @ Haspr

4/28 - webinar

4/22 - Hospital visits / Glen Thomas - LTR to City ✓  
↳ LTR to Hosp (Verify)

5/5 - In House Meeting  
- Zedkey System - what does this mean?

6/1/15 DEQ/OLARA meeting

# Optimization and Maintenance of Optimal Corrosion Control Treatment

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## Preliminary Assessment

U.S. EPA Flint Task Force

11/24/2015

DRAFT

In General need to separate out  
required study components. Must serve as  
a guide for others

## 1.0 Overview

The United States Environmental Protection Agency (EPA) has offered, and the City of Flint has accepted, the assistance of EPA experts on corrosion and corrosion control. This preliminary assessment is intended to document the activities and funding necessary to enable EPA to provide advice and support to the City of Flint in optimizing and maintaining corrosion control treatment under current water quality conditions as well as during and after the upcoming transition to the Karegnondi Water Authority (KWA) pipeline.

[Note: There are many other communities scheduled to transition from their current water sources to the KWA pipeline. Although the source water will be the same for the City of Flint and all communities transitioning to the KWA pipeline source, the intended treatment planned for these communities may differ and the studies undertaken for the City of Flint may or may not be suitable for use by the other communities. It is strongly recommended that the EPA Task Force discuss with the Michigan Department of Environmental Management (MDEQ) the importance of actively working with these additional communities to ensure that proper studies on optimizing and maintaining OCCT are undertaken prior to putting the new KWA source in service for all affected communities. If such studies are not currently underway, they should be initiated as soon as possible.]

## 2.0 Information Request

In order to provide effective advice and assistance, the EPA Task Force should request the following information from the City of Flint.

### 2.1 Current inventory of homes with service line information in excel or similar format.

Pipe loops are corrosion control treatment assessment tools that enable evaluation of the effects of potential water quality changes and different levels of orthophosphate treatment on the existing pipe scales in order to select the most effective treatment before the treatment is applied on a city-wide basis. The pipe loops utilize lead service lines that are actively in service and carefully extracted so that the treatment assessment is conducted with pipes that represent conditions within the distribution system. As it would not be possible to perform service line extractions in the winter without significantly altering or dislodging the scales within the pipes, the identification and extraction of lead service lines should be given the highest priority to ensure that a sufficient number of lead pipes can be identified and extracted as soon as possible. In order to identify suitable homes with lead lines, the EPA Task Force will need current records on lead service line locations to be provided as soon as possible so that sampling can be coordinated and conducted to verify the presence of lead lines.

To minimize the need for excavation, homes with the longest lead service lines should be chosen so that multiple segments can be harvested from each lead line. The lead lines would typically be the longest where the water main is located across the street from the home and the home is set back on the property with respect to the street. An estimated 20 lead pipe segments should be carefully extracted and handled using ORD-specified procedures for use in constructing pipe loops at the treatment plant.

As the scales within the service lines have been subject to significant and iterative water quality changes in a relatively short period of time, it is also necessary to extract additional lead and non-lead portions of service lines to assess the current condition of the scales within the service lines.

*Flint Drinking Water Task Force (FTF-3)  
Preliminary Assessment - Draft November 24, 2015*

2.2 All lead in water testing results for City of Flint, including those not used for Lead and Copper Rule compliance.

Studies have shown that homes served by lead service lines generally have much higher lead levels than homes without lead service lines. As it is anticipated that the City of Flint's service line records will be incomplete, the lead-in-water testing data is a supplemental tool that can be mapped to identify areas of the city that may have higher lead-in-water levels which would indicate the presence of lead service lines. This information will help the EPA Task Force in the identification and extraction of lead service lines for constructing the pipe loops and in identification of areas to test the progress of corrosion control.

2.3 Identification of areas in Flint with elevated blood lead levels.

Similar to the lead-in-water testing, identification of areas (e.g., zip codes, neighborhoods) where blood lead levels have increased since the switch to the Flint River can provide additional data which would indicate the presence of lead service lines for the identification of areas to test the progress of corrosion control.

2.4 Addresses of homes that have had water service interruptions or street disturbances (e.g., water main breaks, road/sidewalk construction, etc.) within the last year.

Streets where there have been potential physical disturbances and homes where the water service has been interrupted should be prioritized for evaluation for the presence of lead service lines as the disturbances can release very high lead and prolonged stagnation can affect the stability of the scales within the pipes.

2.5 Addresses of currently unoccupied homes.

Similar to homes where the water service has been interrupted, homes that are unoccupied should be prioritized for evaluation for the presence of lead service lines as these homes may pose a significant risk to incoming occupants if the home has a lead service line. Recently unoccupied homes also may provide important evaluation locations of water usage impacts on scale stability and lead release/exposure.

2.6 Identification of the pressure zones and location of each of the water quality parameter locations (addresses) within each pressure zone used for water quality parameter measurements (pH, alkalinity, orthophosphate, chlorine, total Coliform) in the distribution system, along with copies of the water quality parameter analytical results for past 4 rounds of monitoring.

In addition to corrosion control treatment optimization, the City of Flint must simultaneously comply with all other applicable National Primary Drinking Water Regulations (NPDWRs). A system-wide assessment of the water quality will provide information necessary to ensure that any potential issues with other NPDWRs can be identified and resolved. Information regarding the water quality in the distribution system is necessary to evaluate the stability of the water quality parameters throughout the distribution system, and to detect locations that may have the highest risk of lead release, TTHM formation, or the presence of microbial contamination.

### 3.0 Immediate Tasks and Timeline

The following tasks should be undertaken immediately (November/December 2015)

- 3.1 Determination on EPA funding commitment(s) (DRA). *No State/Local*
- 3.2 Discussion with Central Regional Laboratory (CRL) regarding laboratory capabilities and support (GWDWB, ORD).
- 3.3 Development of EPA QAPPs encompassing the following activities (GWDWB, ORD, Others\*):
- 3.3.1 Verification of presence of lead service lines\*;
  - 3.3.2 Pipe rig construction, operation, and maintenance;
  - 3.3.3 Treatment assessment monitoring;
  - 3.3.4 Evaluation of lead reservoirs within service lines; and
  - 3.3.5 Evaluation of scale degradation due to stagnation events at unoccupied homes and water shut-offs\*.

\*If these activities are undertaken by one or more of the local partners, QAPP development should be part of the agreement.

- 3.4 Identification of local partners that can coordinate with the EPA Flint Task Force, MDEQ, and the City of Flint, and establishment of agreements to provide assistance on field and other activities (ORD).  
[Potential local partners who have expressed strong interest and willingness to collaborate with EPA include Wayne State University, University of Michigan Flint, Michigan State University, Hurley Medical Center, and Genesee County Health Department.]

- Not part of planning work already done*
- 3.5 Outreach and education - specifics to be determined.  
[Potential local partners Hurley and WSU have asked ORD directly if EPA can provide training/education for their staff on lead in water occurrence, sampling for lead, and corrosion/corrosion control treatment]

- 3.6 Assessment of information from 2.1 to verify the presence of a sufficient number of accessible homes with lead service lines that can be extracted for construction of pipe loops and to evaluate the current state and stability of the scales within the lead and non-lead portions of service lines (TBD).

- 3.7 Extraction of approximately twenty lead line segments with active water for construction of pipe loops, and six additional full service lines with different pipe material (two with lead and galvanized iron, two with lead and copper, and two with lead and plastic segments) for analyzing the lead reservoirs within the lead and non-lead segments of the service lines (TBD).

- 3.8 Risk evaluation and communication on the potential risk from physical disturbances to lead service lines, reoccupation of unoccupied homes and re-establishment of water service following water shut-offs (TBD).

*Flush upon occupying Flint Water Service Center*

#### 4.0 Funding Needs (To Be Determined) <sup>Federal only</sup>

#### 5.0 Proposed EPA Assistance

The narrative below describes the scope of work to be undertaken in providing assistance to the City of Flint and is contingent on adequate funding being provided.

##### 5.1 Lead Service Line Detection Methodology Development

Verification of the presence of lead service lines is necessary for identification and extraction of lead service lines, sampling for treatment assessment, Lead and Copper Rule compliance sampling, risk evaluation and implementation of a lead service line replacement program. Blood lead level ( BLL ) or other lead-related health evaluations also need to be able to identify all lead sources for blood-tested individuals to prioritize risk locations and mitigation strategies. This methodology development is designed to determine if a simple water sampling protocol can give a convenient means to verify with some level of confidence, whether or not a residence has a lead service line, through relatively non-intrusive water sampling. Experience with other utilities has shown that paper records may either under or overestimate the presence of lead service lines.

The strategy to be employed is based on published protocols with improvements being researched by Polytechnique Montreal (Michele Prevost, Elise Deshommes, Clement Cartier). This requires staffing for coordination with Flint paper records, resident contact, plumbing mapping, field sampling ( TBD , but estimated at 20 locations with no LSLs for "control" purposes, and 50 locations believed to have LSL for validation. Development of this protocol could involve re-sampling to test techniques, and could utilize one or more Palintest electrochemical analyzers after validation vs. ICP-MS. EPA-ORD has one Palintest analyzer which can be used. Field personnel would work closely with R5 CRL to test the limits of analytical performance of the Palintest analyzer.

##### 5.2 Corrosion Control Treatment Optimization Evaluations

The corrosion control treatment optimization evaluations are necessarily separated into two stages. The first stage is intended to optimize corrosion control treatment with the current water source and water quality conditions. The second stage is intended to prepare for the transition to the new water source ( KWA Pipeline ) and water quality conditions, and to ensure that the City of Flint is able to simultaneously comply with all National Primary Drinking Water Regulations following the transition to the new source.

**5.2.1 Short-Term (Current) Lead Release Optimization Evaluation.** A lead pipe rig system will be constructed at the Flint water treatment plant with exhumed lead pipes, carefully collected and installed into the pipe rig. EPA-ORD will provide technical assistance in the rig design and construction, as well as the design provisions for chemical additions. One to two people will be required to be on-site to perform periodic chemical analyses and operate and maintain the pipe rig system, as well as to troubleshoot/repair any problems and to collect samples. Laboratory instruments for pH and colorimetric tests (chlorine residual, orthophosphate) will be needed on site. It is anticipated that the design will include a "control" loop and loops with possibly 3-4 different dosages, in duplicate. The

estimated sampling frequency would be at least three times per week, using ICP for metals and ICP-MS for lead on each sample, with one complete characterization sample before each stagnation period. Filtration apparatus will also be needed.

**5.2.2 Simultaneous Compliance Optimization Pilot Testing Prior to Flint Water Plant Treatment of KWA Water.** This effort will necessarily be more expansive than the short-term evaluation. The same control pipes would carry over, but new pipes would need to be stabilized with the current water. Upstream of the lead pipe rig, there would need to be a series of jar tests or a small pilot plant established to optimize coagulation, softening (if necessary), filtration and disinfection processes to meet disinfection byproduct (DBP) limits and microbial inactivation requirements. Investigations are also needed to assess the potential impacts of different possible treated Lake Huron water qualities on chlorine, biofilm growth, water age, microbial pathogens such as *Legionella*, phosphate demand and scaling potential. Pilot evaluations could be done on different unit processes using anticipated Lake Huron water, using university-run pilot plants, shipped or trucked water, etc. Some pilot evaluation analyses could be done on-site with portable analytical instrumentation as is typical. When a final water quality target is determined, the target finished water would become the source water to feed into the lead (and metal) pipe rigs, and thereafter the optimization of phosphate dosing would be done on the stabilized exhumed lead pipes in the pipe rigs. A reservoir may need to be constructed to hold processed simulated Lake Huron treated water produced by the pilot plant and fed to the pipe rigs. This evaluation must be started as soon as possible to allow sufficient time for reliable results to avoid having to conduct full-scale testing on water delivered into the distribution system that could impact Flint consumers after the switch to the KWA pipeline is made.

### **5.3 Lead Source/Release Diagnostic Evaluation**

While the data collected from the pipe loops can provide information on the relative effectiveness of various treatment schemes, conditions at the plant are not the same as within the distribution system. Continued monitoring of lead levels at high risk sites throughout the distribution system is needed to make any necessary adjustments based on actual conditions within the distribution system. EPA estimates that approximately 45 homes will need to be identified for ongoing sampling to inform the treatment optimization process. (15 with lead & copper service line portions, 15 with lead & galvanized iron service lines and if available, 15 with lead and plastic service line portions). This evaluation is necessary for determining what the relative contributions of lead are from different plumbing sources in order to assure optimization of lead and other metal release from the service lines and premise plumbing. Two sampling rounds are the minimum expected for profile sampling which will utilize small volume samples through faucet and sink area and larger (one-liter) samples thereafter. Sampling would involve 15 sites for each combination of plumbing materials (total of 45 sites), with an anticipated 10-15 sequential samples per site for metals per sampling event. Additional samples will be collected and analyzed to characterize the water quality and the sequential samples will be analyzed for Pb, Cu, Fe, Zn, and Al. An experienced plumber or researcher will be needed to map the plumbing at each site, field personnel will be needed to collect and ship samples, and a data manager will be needed to manage the data. If dissolved vs. total metals are desired in the analyses, an addition person with field filtration skills will be needed, in addition to the lab



supplies. If meters, brass or galvanized pipe are found to be a significant source of lead, those devices should be included in the pipe rigs.

#### **5.4 Impact of Water Use/House Occupancy on Stability and Lead Release from Lead and Other Premise Piping.**

There are a large number of unoccupied homes in Flint. Homes which have been unoccupied for an extended period of time can pose a greater risk to incoming residents due to the stagnation of water within the plumbing over an extended period of time which can destabilize the scales within the plumbing and release high lead levels into the water. If access can be facilitated by the City of Flint or other organizations involved with housing, sampling will be conducted at 10-20 vacant or recently occupied homes in conjunction with a flushing program to assess how long it takes for increased water usage to improve the effectiveness of the corrosion control treatment for these homes. Sequential sampling profiles would be done for metals as well as chlorine residuals for each home. Flushing for different times would be tested and evaluated with repeated profile sampling to see if there is any improvement in lowering lead levels with increased water use.

#### **5.5 Protocol for Exposure Estimation Sampling for Health-Related Evaluations (Premise & Building Plumbing).**

This protocol development would compare various potential options for sampling to estimate the cumulative metal exposure from the drinking water in premise plumbing or schools. Comparisons would be made with manual or automated proportional sampling, tap POU units that could log water use and be disassembled and digested for metal content, and random daytime sampling protocols. Different types of POU-suitable filtration apparatus would be tested to see if designs would permit quantitative separation of dissolved versus particulate lead and other metals. Support would be needed for setting up and operating test systems, analyzing virgin and exposed filter/device materials with accumulated metals, building and installation of proportional samplers or development of protocol for resident-collected samples, rapid turn-around Lead and other water analyses of test exposure water fed into experimental systems.

#### **5.6 Risk communication on lead service lines**

Request OEJ support/assistance for the development and dissemination of risk communication material on lead service lines, including the potential risk from physical disturbances to lead service lines and lead reservoirs in other pipes downstream of lead service lines.

#### **5.7 Pipe analyses for long-term treatment assessment and mechanisms of lead and other metals release**

Optimization of corrosion control treatment requires specialized knowledge on scale chemistry as well as specialized equipment and equipment operating skills. The timeline for activities related to evaluating the progress in optimizing corrosion control treatment following the transition to the KWA pipeline source will extend beyond the current fiscal year and likely well into FY 2017. The necessary resources and expertise must continue to be made available to the Task Force for the expected duration of the project in order to ensure a successful outcome

which would enable the City of Flint to simultaneously comply with all NPDWRs following the transition to the KWA pipeline.

#### 6.0 Timeline

The proposed activities are contingent upon available funding. As such, it is not possible at this time to develop a meaningful timeline, with the exception of the activities in Section 2.0 and some of the activities in Section 3.0 which are discussed in those sections. Once funding is secured a detailed timeline will be developed that incorporates both funded and unfunded activities. A Task Force member will be identified as the lead person responsible for ensuring the completion of each activity or group of activities to ensure that the work is completed in accordance with the timeline.

DRAFT

| WSSN  | System         | Mon Prd | Collect Date | Site Code | Address                   | Analyte | Result | Unit | LRAA  | Units |
|-------|----------------|---------|--------------|-----------|---------------------------|---------|--------|------|-------|-------|
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP1      | 3719 DAVISON ROAD         | 2950    | 0.162  | MG/L | 0.041 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP2      | 3302 SOUTH DORT HIGHWAY   | 2950    | 0.112  | MG/L | 0.028 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP3      | 6204 NORTH SAGINAW STREET | 2950    | 0.097  | MG/L | 0.024 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP4      | 2501 FLUSHING ROAD        | 2950    | 0.106  | MG/L | 0.027 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP5      | 3606 CORUNNA RD           | 2950    | 0.079  | MG/L | 0.02  | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP6      | 5018 CLIO RD              | 2950    | 0.088  | MG/L | 0.022 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP7      | 3216 MLK BLVD             | 2950    | 0.082  | MG/L | 0.021 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP8      | 822 S DORT HWY            | 2950    | 0.075  | MG/L | 0.019 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP1      | 3719 DAVISON ROAD         | 2950    | 0.145  | MG/L | 0.077 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP2      | 3302 SOUTH DORT HIGHWAY   | 2950    | 0.127  | MG/L | 0.06  | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP3      | 6204 NORTH SAGINAW STREET | 2950    | 0.118  | MG/L | 0.054 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP4      | 2501 FLUSHING ROAD        | 2950    | 0.196  | MG/L | 0.076 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP5      | 3606 CORUNNA RD           | 2950    | 0.181  | MG/L | 0.065 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP6      | 5018 CLIO RD              | 2950    | 0.144  | MG/L | 0.058 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP7      | 3216 MLK BLVD             | 2950    | 0.112  | MG/L | 0.049 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP8      | 822 S DORT HWY            | 2950    | 0.112  | MG/L | 0.047 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP1      | 3719 DAVISON ROAD         | 2950    | 0.059  | MG/L | 0.092 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP2      | 3302 SOUTH DORT HIGHWAY   | 2950    | 0.033  | MG/L | 0.068 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP3      | 6204 NORTH SAGINAW STREET | 2950    | 0.041  | MG/L | 0.064 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP4      | 2501 FLUSHING ROAD        | 2950    | 0.094  | MG/L | 0.099 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP5      | 3606 CORUNNA RD           | 2950    | 0.034  | MG/L | 0.074 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP6      | 5018 CLIO RD              | 2950    | 0.054  | MG/L | 0.072 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP7      | 3216 MLK BLVD             | 2950    | 0.05   | MG/L | 0.061 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP8      | 822 S DORT HWY            | 2950    | 0.036  | MG/L | 0.056 | MG/L  |

| WSSN  | System         | Mon Prd | Site Code | Ave Type | Analyte | Results Used | LRAA  | Units |
|-------|----------------|---------|-----------|----------|---------|--------------|-------|-------|
| 02310 | FLINT, CITY OF | 4Q2014  | DBP1      | OEL      | TTHM    | 3            | 0.106 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP2      | OEL      | TTHM    | 3            | 0.076 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP3      | OEL      | TTHM    | 3            | 0.074 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP4      | OEL      | TTHM    | 3            | 0.122 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP5      | OEL      | TTHM    | 3            | 0.082 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP6      | OEL      | TTHM    | 3            | 0.085 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP7      | OEL      | TTHM    | 3            | 0.074 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP8      | OEL      | TTHM    | 3            | 0.065 | MG/L  |

| WSSN  | System         | Mon Prd | Collect Date | Site Code | Address                   | Analyte | Result | Unit | LRAA  | Units |
|-------|----------------|---------|--------------|-----------|---------------------------|---------|--------|------|-------|-------|
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP1      | 3719 DAVISON ROAD         | 2950    | 0.162  | MG/L | 0.041 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP2      | 3302 SOUTH DORT HIGHWAY   | 2950    | 0.112  | MG/L | 0.028 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP3      | 6204 NORTH SAGINAW STREET | 2950    | 0.097  | MG/L | 0.024 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP4      | 2501 FLUSHING ROAD        | 2950    | 0.106  | MG/L | 0.027 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP5      | 3606 CORUNNA RD           | 2950    | 0.079  | MG/L | 0.02  | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP6      | 5018 CLIO RD              | 2950    | 0.088  | MG/L | 0.022 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP7      | 3216 MLK BLVD             | 2950    | 0.082  | MG/L | 0.021 | MG/L  |
| 02310 | FLINT, CITY OF | 2Q2014  | 21-May-14    | DBP8      | 822 S DORT HWY            | 2950    | 0.075  | MG/L | 0.019 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP1      | 3719 DAVISON ROAD         | 2950    | 0.145  | MG/L | 0.077 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP2      | 3302 SOUTH DORT HIGHWAY   | 2950    | 0.127  | MG/L | 0.06  | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP3      | 6204 NORTH SAGINAW STREET | 2950    | 0.118  | MG/L | 0.054 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP4      | 2501 FLUSHING ROAD        | 2950    | 0.196  | MG/L | 0.076 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP5      | 3606 CORUNNA RD           | 2950    | 0.181  | MG/L | 0.065 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP6      | 5018 CLIO RD              | 2950    | 0.144  | MG/L | 0.058 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP7      | 3216 MLK BLVD             | 2950    | 0.112  | MG/L | 0.049 | MG/L  |
| 02310 | FLINT, CITY OF | 3Q2014  | 21-Aug-14    | DBP8      | 822 S DORT HWY            | 2950    | 0.112  | MG/L | 0.047 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP1      | 3719 DAVISON ROAD         | 2950    | 0.059  | MG/L | 0.092 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP2      | 3302 SOUTH DORT HIGHWAY   | 2950    | 0.033  | MG/L | 0.068 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP3      | 6204 NORTH SAGINAW STREET | 2950    | 0.041  | MG/L | 0.064 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP4      | 2501 FLUSHING ROAD        | 2950    | 0.094  | MG/L | 0.099 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP5      | 3606 CORUNNA RD           | 2950    | 0.034  | MG/L | 0.074 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP6      | 5018 CLIO RD              | 2950    | 0.054  | MG/L | 0.072 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 19-Nov-14    | DBP7      | 3216 MLK BLVD             | 2950    | 0.05   | MG/L | 0.061 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | 20-Nov-14    | DBP8      | 822 S DORT HWY            | 2950    | 0.036  | MG/L | 0.056 | MG/L  |

| WSSN  | System         | Mon Prd | Site Code | Ave Type | Analyte | Results Used | LRAA  | Units |
|-------|----------------|---------|-----------|----------|---------|--------------|-------|-------|
| 02310 | FLINT, CITY OF | 4Q2014  | DBP1      | OEL      | TTHM    | 3            | 0.106 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP2      | OEL      | TTHM    | 3            | 0.076 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP3      | OEL      | TTHM    | 3            | 0.074 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP4      | OEL      | TTHM    | 3            | 0.122 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP5      | OEL      | TTHM    | 3            | 0.082 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP6      | OEL      | TTHM    | 3            | 0.085 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP7      | OEL      | TTHM    | 3            | 0.074 | MG/L  |
| 02310 | FLINT, CITY OF | 4Q2014  | DBP8      | OEL      | TTHM    | 3            | 0.065 | MG/L  |

Call to Flint EM

- Howard Craft

- Duff Johnson

Director

Jim Sygo

Liane Sheth-Smith

Steve Busch

- Mike Glasco

Wed. Morning in Flint

10-12

3 issues

① BWA

② TTHM

- OE status

- Messaging after 3rd Round of samples

- Turn Around Perception + Communication

③ Legionella

- DCH Epidemiology Study

- Flint Water Not Likely

- McLaren Hospital

↳ Ability to chlorinate

↳ X-ray Inspection

↳ contained



## Big Picture

- Detroit currently supplies Flint + GCD



IP Detroit is cost competitive

Highest Cost ① Why can't DWSD provide full supply to Flint?

Middle Cost ② DWSD would require Flint WTP to increase treatment complexity & cost

Lowest Cost ③ Under RWA Flint WTP uses less complex treatment & meets needs  
↳ lower cost

Withdrawal Report - KWA all new water?  
Annual Progress Report

Flint - State or KWA would handle bonds

Bot Out → Apr 2011

KWA purchase piping directly

Check w/ Bot Cont on Bin Classification

- Row Water cl Dose Unusual

Ag - currently Process not for Irrigation

Andy Labanum → OK w/ Industrial not Irrigation

Spencer - Wetland Issues

Wade Team / AECOM - Transmission Lines

Larry Osborn - Design Main Contact



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING



DAN WYANT  
DIRECTOR

September 16, 2015

VIA E-MAIL

The Honorable Daniel Kildee  
United States House of Representatives  
Washington, DC 20515

Dear Congressman Kildee:

Thank you for your September 9, 2015, letter regarding your concerns for the drinking water in the city of Flint (Flint). The Michigan Department of Environmental Quality (MDEQ) is working closely with Flint's water department as well as the U.S. Environmental Protection Agency (USEPA) to ensure Flint residents have ample water that meets state and federal drinking water standards.

The MDEQ's role is to administer its nearly 40-year-old state drinking water protection program based on federal guidelines. The MDEQ works with approximately 11,500 public water systems in the state to monitor for more than 90 primary drinking water contaminants and ensure that every supply consistently provides safe drinking water.

In Flint, the city made a decision 18 months ago to switch drinking water sources. This change required them to take specific measures under the federal Lead and Copper Rule, which was enacted in 1991 to monitor water as it interacts with lead service connections and home plumbing. Flint's test results were conducted according to the same testing protocols every Michigan community uses and the same protocols Flint has used to test its water every three years for the past 25 years.

While the results from Flint's testing show compliance with the federal action level for lead and copper, on August 17, 2015, the MDEQ instructed the city to move forward expeditiously with developing additional corrosion control treatment to minimize the corrosive effects between drinking water and lead service connections and home plumbing in the Flint service area.

We appreciate and share your concern for the situation, and the MDEQ looks forward to providing you a detailed briefing next week. If you have any additional questions in the meantime, please contact Ms. Maggie Pallone, Deputy Director, Policy and Legislative Affairs, at 517-284-6704 or [pallonem@michigan.gov](mailto:pallonem@michigan.gov); or you may contact me.

Sincerely,

Dan Wyant  
Director  
517-284-6700



The Honorable Daniel Kildee

Page 2

September 16, 2015

cc: Senator Jim Ananich  
Representative Sheldon Neeley  
Representative Phil Phelps  
Mayor Dayne Walling, City of Flint  
Mr. Howard Croft, City of Flint  
Dr. Susan Hedman, Regional Administrator, USEPA, Region 5  
Mr. Thomas Poy, USEPA, Region 5  
Ms. Denise Fortin, USEPA, Region 5  
Mr. Michael Schock, USEPA  
Mr. Darren Lytle, USEPA  
Mr. Marc Edwards, Virginia Tech  
Mr. Harvey Hollins, Governor's Southeast Michigan Office  
Mr. Bill McBride, Governor's Washington Office  
Mr. Eric Brown, Governor's Washington Office  
Mr. Jim Sygo, Chief Deputy Director, MDEQ  
Ms. Madhu R. Anderson, Deputy Director, MDEQ  
Ms. Maggie Pallone, Deputy Director, MDEQ  
Ms. Sarah M. Howes, Legislative Liaison, MDEQ  
Mr. Brad Wurfel, Communications Director, MDEQ  
Ms. Liane Shekter Smith, MDEQ  
Mr. Stephen Busch, MDEQ  
Mr. Pat Cook, MDEQ



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING



DAN WYANT  
DIRECTOR

September 17, 2015

VIA E-MAIL

The Honorable Jim Ananich  
State Senator  
State Capitol  
P.O. Box 30036  
Lansing, Michigan 48909-7536

The Honorable Sheldon Neeley  
State Representative  
State Capitol  
P.O. Box 30014  
Lansing, Michigan 48909-7514

The Honorable Phil Phelps  
State Representative  
State Capitol  
P.O. Box 30014  
Lansing, Michigan 48909-7514

Dear Senator Ananich and Representatives Neeley and Phelps:

Thank you for your letter of September 10, 2015, regarding water quality in the city of Flint (City). Your interest in this matter is appreciated. The Michigan Department of Environmental Quality (MDEQ) takes seriously its responsibility to ensure safe drinking water for all Michigan residents. The MDEQ maintains a robust public water supply regulatory program through long-standing partnerships with the United States Environmental Protection Agency (USEPA) and the state's regulated public water systems.

With respect to the draft memo referenced in your letter, the MDEQ does not review or receive draft memos from the USEPA, nor would we expect to while it is a draft.

Regulations associated with lead, copper, and corrosion control require communities to monitor water quality at customer taps. The monitoring protocols for sampling home water attempt to represent actual home water use, and they allow the MDEQ to get consistent results for year-over-year comparisons.

It is important to recognize that any home with lead plumbing or service connections will impart some amount of lead to water samples. While the compliance monitoring for lead in the City has not exceeded the federally-established Action Level, either before or after the City switched sources and treatment methods, there has always been

The Honorable Jim Ananich  
The Honorable Sheldon Neeley  
The Honorable Phil Phelps  
Page 2  
September 17, 2015

detectable lead in the City's water sampling program for homes that have lead plumbing or service connections. The City's monitoring program's purpose is to show aggregated levels throughout the entire system, not individual home levels.

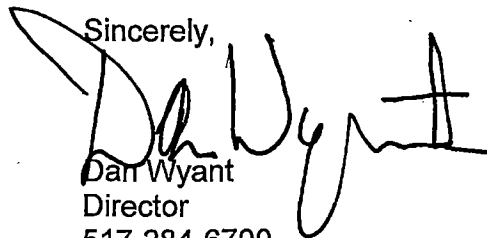
The law requires the City to provide individual lead results to customers whose homes are sampled for compliance with the Action Level. Each customer with an individual sample result that exceeds 15 parts per billion is provided information on actions they can take to limit lead exposure in their drinking water. System-wide results from the most recent lead compliance monitoring are included each year in the City's annual Consumer Confidence Report, which is provided to customers and available online.

It is important to note that the City performed extensive home water tests for lead and copper last year and this year, and is meeting state and federal drinking water standards. Local health departments also administer annual blood level testing on children in Flint; results show no discernable rise in levels that might be expected if there was an elevated lead level in the City water supply. The City currently has no unresolved violations of state and federal drinking water standards.

The MDEQ continues to work with the City and federal regulators on the shared goal of ensuring safe, reliable drinking water in this community.

I look forward to discussing this issue in greater detail at the meeting next week. If you should have additional questions before then, please contact Ms. Maggie Pallone, Deputy Director, Policy and Legislative Affairs, at 517-284-6715 or [pallonem@michigan.gov](mailto:pallonem@michigan.gov); or you may contact me.

Sincerely,



Dan Wyant  
Director  
517-284-6700

The Honorable Jim Ananich  
The Honorable Sheldon Neeley  
The Honorable Phil Phelps  
Page 3  
September 17, 2015

cc: U.S. Representative Dan Kildee  
Mayor Dayne Walling, City of Flint  
Mr. Howard Croft, City of Flint  
Dr. Susan Hedman, Regional Administrator, USEPA, Region 5  
Mr. Thomas Poy, USEPA, Region 5  
Ms. Denise Fortin, USEPA, Region 5  
Mr. Michael Schock, USEPA  
Mr. Darren Lytle, USEPA  
Mr. Marc Edwards, Virginia Tech  
Mr. Harvey Hollins, Governor's Southeast Michigan Office  
Mr. Bill McBride, Governor's Washington Office  
Mr. Eric Brown, Governor's Washington Office  
Mr. Jim Sygo, Chief Deputy Director, MDEQ  
Ms. Madhu R. Anderson, Deputy Director, MDEQ  
Ms. Maggie Pallone, Deputy Director, MDEQ  
Ms. Sarah M. Howes, Legislative Liaison, MDEQ  
Mr. Brad Wurfel, Communications Director, MDEQ  
Ms. Liane Shekter Smith, MDEQ  
Mr. Richard Benzie, MDEQ  
Mr. Stephen Busch, MDEQ  
Mr. Pat Cook, MDEQ

KWA  
~~LH PS~~  
60 MGD ✓ firm

56' BGL

4 VT Pumps  
↳ 1 VFD

well size

↳ portable pump down time?

Zebra mussel part-time? → Batch load  
vs. "when pumps running" will run monthly through  
summer

20 MGD @ 425' TDA

30 MGD @ 320' TDA

C=100 Normal

C=140 Min Flow

2500 HP 1.153F

oil down actuators X-conn?

250 ps.

Curves w/ In. PS 205

KWA Int. PS

-CI Biofilm control

Normal Range?

7 MG Storage - Basin

↳ @ 60 MGD  $\approx$  3 hrs. Empty  
70 MGD (Ft) 24 hrs if empty

Max Day 50 MGD  $\rightarrow$  ?  
36  
+20 = 56 MGD

Back pressure Sustaining Valve (for 2?)

Storage 10 vs 7 MGD

25 MGD @ 205'

16.67 MGD @ 286'  $C=120$

5% > than LAPS

@ 1 MGD greater 7 days to 7 MGD

↑ (but this assumes empty to full)

## Flint WTP

- $\rightarrow$  If use Flint River  
regardless of amount - LT2 Impacts  
Change Treatment Requirements
    - Chem Storage Exp. \$2.1 M  
 $\text{CO}_2$ ,  $\text{H}_2\text{O}_2$ ,  $\text{H}_2\text{S}$
    - UV Disinfect + C&T \$7.0 M
    - Add'l backup power need capital + O&M
    - Add'l O&M @ WTP
    - Zebra Mussels \$0.3 M
  - Higher Demand (River)
    - Softening
      - Lime Sludge Disposal \$15.1
- Total
- \$50 Million Capital
    - $\rightarrow$  40 M req vs. 10 recommend



12/9/2015

Call w/ EPA (Flint)

Draft Optimization + Maintenance

- Mike Glasgow

- Bob

- Mike Schuler

- Miguel

- Darren Lytle

- Tim

- Flint cards digitized by Feb.



DRAFT 9/17/2015

### City of Flint Water System Background

Water Service Land Area 34 square miles  
550+ miles of public water mains  
250+ miles of water mains 75+ years old  
70% of public water mains are unlined cast iron pipe  
Service population 99,763  
Service connections 32,900  
Flint Water System established in 1883  
Flint Water Treatment Plant #2 completed in 1954  
Connection to Detroit Water and Sewerage Department 1967  
Flint Water Treatment Plant #2 rehabilitated 1999 – 2005

### City of Flint Timeline

April 2013 – Flint notifies DWSD of contract discontinuation and joins the Karegnondi Water Authority  
April 2013 – DWSD sets termination of Flint water service contract to April 17, 2014  
June 2013 – Karegnondi Water Authority groundbreaking  
June 2013 – Flint notifies DEQ of intent to use of Flint Water Treatment Plant full time with Flint River  
May 2014 – Flint stops purchasing DWSD water. Starts using the City of Flint WTP and Flint River  
August 2014 – Flint E.Coli Bacteria violation, Partial System Boil Water Advisory  
August 2014 – Disinfection Byproducts, DEQ requests preemptive Operational Evaluation  
September 2014 – Flint Total Coliform Bacteria violation, Partial System Boil Water Advisory  
November 2014 – Disinfection Byproducts violation begins  
January 2015 – 1<sup>st</sup> 6 month lead and copper sampling completed 100 samples, 90<sup>th</sup>% = 6 ppb  
July 2015 – 2<sup>nd</sup> 6 month lead and copper sampling completed 69 samples, 90<sup>th</sup>% = 11 ppb  
August 2015 – Disinfection Byproducts return to compliance  
August 2015 – Flint required by DEQ to recommend and install Optimized Corrosion Control Treatment  
  
January 2016 – Flint plans to have Optimized Corrosion Control Treatment operational  
July 2016 – Planned connection to Karegnondi Water Authority (Lake Huron water to Flint WTP)

DANIEL T. KILDEE

5th District, Michigan

COMMITTEE ON  
FINANCIAL SERVICES

SUBCOMMITTEE ON  
HOUSING AND INSURANCE

SUBCOMMITTEE ON  
MONETARY POLICY AND TRADE

SENATOR WILCOX

DEMOCRATIC POLICY AND  
COMMUNICATIONS COMMITTEE



# Congress of the United States

House of Representatives

Washington, DC 20515

September 9, 2015

WASHINGTON OFFICE

227 Cannon House Office Building

Washington, DC 20515

(202) 225-3511

(202) 225-6393 (Fax)

DISTRICT OFFICE

111 EAST COURT STREET #33

FLINT, MI 48902

(810) 238-8627

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WWW.DANKILDEE.HOUSE.SOV

Twitter: @RepDanKildee

Facebook: RepDanKildee

Ms. Gina McCarthy  
Administrator  
Environmental Protection Agency  
1200 Pennsylvania Ave. NW  
Washington, D.C. 20460

DEO  
RESOURCE MANAGEMENT DIVISION

SEP 16 2015

LANSING DISTRICT

Mr. Dan Wyant  
Director  
Michigan Department of Environmental Quality  
P.O. Box 30473  
Lansing, MI 48909

Administrator McCarthy and Director Wyant:

The attached June 24, 2015, memorandum between two Environmental Protection Agency (EPA) employees, Miguel A. Del Toral and Thomas Poy, published recently by the American Civil Liberties Union of Michigan, suggests that there are high lead levels in the city of Flint, Mich., water transmission lines. Furthermore, this document reflects that children consuming this water had levels of lead in their blood in excess of three times what they were prior to the city of Flint switching its source water from the Detroit Water and Sewage Department (DWSD) to the Flint River.

In addition, this memorandum makes recommendations to Mr. Poy, Chief of the Ground Water and Drinking Water Branch of EPA Region 5, to do three things. First, for the EPA to work with the Michigan Department of Environmental Quality (MDEQ) to provide technical assistance to the city of Flint to deal with water quality issues. Second, it suggests the EPA review the compliance status of the city of Flint in respect to its compliance with the Lead and Copper Rule (LCR). Third, the memorandum recommends that the EPA conduct a review of the city of Flint testing procedures to ensure they are compliant with the LCR.

Regarding this memorandum and the surrounding water quality issues in the city of Flint, I have the following questions:

- Was this memorandum actually sent to Mr. Poy?

- Are the findings in the memorandum regarding the lead levels in the city of Flint water accurate?
- If there were in fact high levels of lead in the water in the city of Flint, when did the EPA and/or MDEQ plan to alert the public?
- What, if any, of the recommendations has the EPA followed from the memorandum?
- Given the demonstrated level of lead in the water in Flint, MI, is the water safe?

Regardless, I am very troubled by recent tests suggesting high levels of lead in the city of Flint's water system. As you know, on the EPA's website it says that lead above the "action level" in drinking water can cause a variety of adverse health effects, including delays in physical and mental development in babies and children.

According to the Safe Drinking Water Act, the EPA has the responsibility of enforcing water quality standards. EPA, however, has given the primary responsibility of enforcing water quality standards to the state of Michigan via MDEQ. As such, it is the responsibility of these agencies to ensure that the people of the city of Flint have safe drinking water.

Thank you and I look forward to hearing from you soon.

Sincerely,



Dan Kildee  
MEMBER OF CONGRESS

cc:

State Senator Jim Ananich  
State Representative Sheldon Neeley  
State Representative Phil Phelps  
Mayor Dayne Walling, City of Flint  
Howard Croft, City of Flint  
Susan Hedman, EPA  
Thomas Poy, EPA  
Michael Schock, EPA-ORD  
Darren Lytle, EPA-ORD  
Denise Fortin, EPA  
Liane Shekter-Smith, MDEQ  
Pat Cook, MDEQ  
Stephen Busch, MDEQ  
Brad Wurfel, MDEQ  
Marc Edwards, Virginia Tech



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

**WG-15J**

**June 24, 2015**

**MEMORANDUM**

SUBJECT: High Lead Levels in Flint, Michigan – Interim Report

FROM: Miguel A. Del Toral *MDT*  
Regulations Manager, Ground Water and Drinking Water Branch

TO: Thomas Poy  
Chief, Ground Water and Drinking Water Branch

The purpose of this interim report is to summarize the available information regarding activities conducted to date in response to high lead levels in drinking water reported by a resident in the City of Flint, Michigan. The final report will be submitted once additional analyses have been completed on pipe and water samples.

Following a change in the water source, the City of Flint has experienced a number of water quality issues resulting in violations of National Primary Drinking Water Regulations (NPDWR) including acute and non-acute Coliform Maximum Contaminant Level (MCL) violations and Total Trihalomethanes (TTHM) MCL violations as follows:

- Acute Coliform MCL violation in August 2014
- Monthly Coliform MCL violation in August 2014
- Monthly Coliform MCL violation in September 2014
- Average TTHM MCL violation in December 2014
- Average TTHM MCL violation in June 2015

In addition, as of April 30, 2014, when the City of Flint switched from purchasing finished water from the City of Detroit to using the Flint River as their new water source, the City of Flint is no longer providing corrosion control treatment for lead and copper.

A major concern from a public health standpoint is the absence of corrosion control treatment in the City of Flint for mitigating lead and copper levels in the drinking water. Recent drinking water sample results indicate the presence of high lead results

in the drinking water, which is to be expected in a public water system that is not providing corrosion control treatment. The lack of any mitigating treatment for lead is of serious concern for residents that live in homes with lead service lines or partial lead service lines, which are common throughout the City of Flint.

In addition, following the switch to using the Flint River, the City of Flint began adding ferric chloride, a coagulant used to improve the removal of organic matter, as part of the strategy to reduce the TTHM levels. Studies have shown that an increase in the chloride-to-sulfate mass ratio in the water can adversely affect lead levels by increasing the galvanic corrosion of lead in the plumbing network.

Prior to April 30, 2014, the City of Flint purchased finished water from the City of Detroit which contained orthophosphate, a treatment chemical used to control lead and copper levels in the drinking water. When the City of Flint switched to the Flint River as their water source on April 30, 2014, the orthophosphate treatment for lead and copper control was not continued. In effect, the City of Flint stopped providing treatment used to mitigate lead and copper levels in the water. In accordance with the Lead and Copper Rule (LCR), all large systems (serving greater than 50,000 persons) are required to install and maintain corrosion control treatment for lead and copper. In the absence of any corrosion control treatment, lead levels in drinking water can be expected to increase.

The lack of mitigating treatment is especially concerning as the high lead levels will likely not be reflected in the City of Flint's compliance samples due to the sampling procedures used by the City of Flint for collecting compliance samples. The instructions from the City of Flint to residents direct the residents to 'pre-flush' the taps prior to collecting the compliance samples. A copy of the instructions provided by the City of Flint to residents will be included in the final report.

The practice of pre-flushing before collecting compliance samples has been shown to result in the minimization of lead capture and significant underestimation of lead levels in the drinking water. Although this practice is not specifically prohibited by the LCR, it negates the intent of the rule to collect compliance samples under 'worst-case' conditions, which is necessary for statistical validity given the small number of samples collected for lead and copper under the LCR. This is a serious concern as the compliance sampling results which are reported by the City of Flint to residents could provide a false sense of security to the residents of Flint regarding lead levels in the water and may result in residents not taking necessary precautions to protect their families from lead in the drinking water. Our concern regarding the inclusion of 'pre-flushing' in sampling instructions used by public water systems in Michigan has been raised with the Michigan Department of Environmental Quality (MDEQ). The MDEQ has indicated that this practice is not prohibited by the LCR and continues to retain the 'pre-flushing' recommendation in their lead compliance sampling guidance to public water systems in Michigan. A copy of the MDEQ guidance will be included in the final report.

In the case of the Flint resident that contacted U.S. EPA (Ms. Lee-Anne Walters), the initial results from drinking water samples collected by the City of Flint in her home

for lead were 104 ug/L and 397 ug/L. The level of iron in the water also exceeded the capability of the measurement ( $>3.3$  mg/L). The lead results were especially alarming given that the samples were collected using the sampling procedures described above, which minimize the capture of lead. When contacted by U.S. EPA Region 5, the MDEQ indicated that the lead was coming from the Walters' plumbing. Ms. Walters had previously indicated that all of the plumbing in the home was plastic.

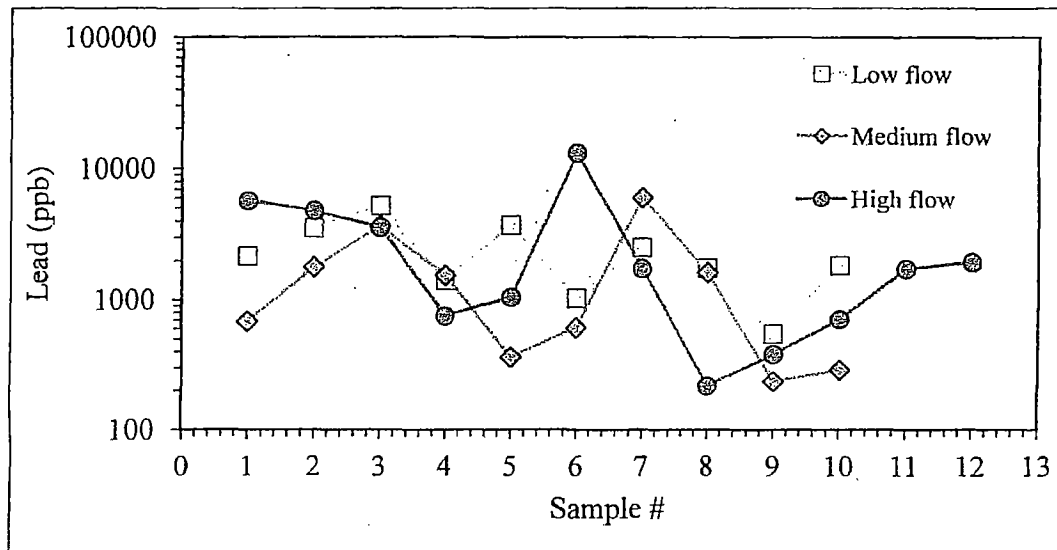
Following the confirmation of the initial high lead results, U.S. EPA Region 5 conducted two visits to the Walters' home on April 27, 2015 and May 6, 2015. Based on an inspection of the plumbing and subsequent sampling conducted at the Walters' residence, it was determined that except for a few minor metallic connectors, all interior plumbing, including the pipes, valves and connectors are made of plastic certified by the National Sanitation Foundation (NSF) for use in drinking water applications. Subsequent sampling showed that the faucets in the home appear to be compliant with the new lead-free requirements and are also not the source for the high lead levels. Our inspection of the interior plumbing and analysis of follow-up sampling results demonstrate that the home plumbing network is not the source of the high lead levels found at the Walters' residence. The photographs and all sampling results will be included in the final report.

Based on the U.S. EPA inspection and documentation of the plastic plumbing at the Walters' residence, it was suspected that the high lead was being introduced into the Walters' home plumbing from outside the home, likely from a lead service line. Three portions of the service line were extracted during a subsequent trip on May 6, 2015 and sent for analysis, when the Walters' service line was replaced. Analyses performed to date indicate that a portion of the service line is made of galvanized iron pipe. Inspection of the remaining portion from the water main to the external shut-off valve confirmed that the portion from the water main to the external shut-off valve is a lead service line.

Ms. Walters has also provided U.S. EPA with medical reports on her child's blood lead testing indicating that the child had a low blood lead level (2 ug/dL) prior to the source water switch and an elevated blood lead level following the switch (6.5 ug/dL). Redacted copies of these reports will also be included in the final report.

Subsequent to the discovery of high lead levels in the Walters' drinking water, the water to the Walters' home was shut off on April 3, 2015. The water was briefly turned back on to collect additional samples on April 28, 2015. Since the water had stagnated for an extended period of time, the kitchen tap was flushed for 25 minutes the night before collecting the samples. Three sets of samples were collected at different flow rates (10 at low flow, 10 at medium flow and 10 at high flow).

The drinking water samples collected from the Walters' residence on April 28, 2015 contained extremely high lead levels, ranging in value from 200 ug/L to 13,200 ug/L (see below).



*Sample results and graph are provided courtesy of Virginia Tech*

Additional sample results from resident-requested samples have also shown lead levels in excess of the lead action level. As with the samples collected by the City of Flint for compliance, the resident-requested samples are also being collected using the 'pre-flushing', so the lead levels captured in these samples likely do not represent the worst-case lead levels in the water and the actual lead levels at these homes may be much higher.

Pending completion of the final report, my interim recommendations are as follows:

1. The U.S. EPA should follow up with the MDEQ and the City of Flint on the recommendation made by U.S. EPA to MDEQ on June 10, 2015 to offer the City of Flint technical assistance on managing the different water quality issues in Flint, including lead in the drinking water. Although there have been two written assessments regarding water quality and operational issues in Flint at the time of this report, they do not address lead in drinking water. The first is an Operational Evaluation Report (OER) produced in November 2014 by Lockwood, Andrews and Newnam, Inc. to assess the factors contributing to high Total Trihalomethane (TTHM) levels in Flint following the source change. The focus of this report is to identify potential causes and remedial actions for lowering TTHM levels. The second report (Water Quality Report) produced by Veolia for the City of Flint on March 12, 2015, is an assessment of Flint's water quality and operations which provides advice to the City of Flint primarily focused on TTHM control and other operational issues. Both reports were written prior to the recent discovery of high lead results in Flint drinking water. As such, the reports do not take into account the potential effects on lead levels in drinking water.

- As previously mentioned, the City of Flint currently has no mitigating treatment for lead and is also planning another source water change in the near future. U.S. EPA's Office of Research and Development in Cincinnati has extensive experience in corrosion and corrosion control treatment and distribution system issues and would be a valuable addition to the drinking water advisory group for the City of Flint. Copies of the qualifications and experience for Michael Schock and Darren Lytle have been forwarded to MDEQ.
2. U.S. EPA should review the compliance status of the City of Flint with respect to whether the system is in violation of the LCR requirement to install and maintain optimal corrosion control and whether the MDEQ is properly implementing the LCR provisions regarding optimal corrosion control treatment requirements for large systems. Pursuant to 40 CFR Section 141.82(i), the EPA Regional Administrator may review treatment determinations made by a State and issue federal treatment determinations consistent with the requirements of the LCR where the Regional Administrator finds: (1) A state has failed to issue a treatment determination by the applicable deadlines; (2) A State has abused its discretion in a substantial number of cases or in cases affecting a substantial population; or (3) The technical aspects of a State's determination would be indefensible in an expected Federal enforcement action taken against a system.
  3. The U.S. EPA should review whether relevant resident-requested samples are being included by the City of Flint in calculating the 90<sup>th</sup> percentile compliance value for lead. Recent drinking water tests conducted at homes in Flint for lead that are not part of the compliance sampling pool have revealed high lead levels in the drinking water. The U.S. EPA memorandum signed on December 23, 2004 provides clarification on compliance determinations and states that customer-requested samples are to be included in the 90<sup>th</sup> percentile lead compliance calculation where the sampling is conducted during the monitoring period from sites and sampling procedures meeting the LCR criteria. Given the prevalence of lead service lines in the City of Flint, should these sample results be from homes with lead service lines, the sample results would be considered compliance samples under the LCR.

Also attached is a timeline of events for Flint, Michigan. Should you have any questions regarding the information or recommendations provided, please let me know.

cc: Liane Shekter-Smith (MDEQ)  
Pat Cook (MDEQ)  
Stephen Busch (MDEQ)  
Michael Prysby (MDEQ)  
Marc Edwards (Virginia Tech)  
Michael Schock, EPA-ORD  
Darren Lytle, EPA-ORD



Flint/EPA Mtg. Call-In 11/15/2015

|                           |                   |           |
|---------------------------|-------------------|-----------|
| Miguel                    | - Samir           |           |
| Bob Kaplan                | - Jeremy          | - Darren  |
| Tim <del>Bill</del> Henry | - Warren          | - Mike S. |
| Tom Poy                   | - <del>Jeff</del> |           |
| - Jeff                    | - Steve B.        | - Mike P. |
| - Mike G.                 | - Liam            |           |
| - Natasha                 | - Jim S.          |           |

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- WTP Shakedown

Warren Genesee County

Flint  $\rightarrow$  Genesee Co. not GCDC  $\rightarrow$  Flint  
Hyd. Model Updated  
but closed valve issues  
900 paved over

Install 3-4 MGD small dia line

Aug. 3-12 now 36 MGD capacity

City of Flint / GCDC Interconnect 24" line  
add'l WM + Pump Station

John O'Brien + Howard had met <sup>years ago</sup> unknown results

Over the ground pipeline  
3 miles

Storage  $\approx 60$  MG  
1.5 days to fill plant  
4 days to run

GCDL / Flint Line

Filter Transfer Station (To Dart?)  
Reversible?  
8 MGD

20 MGD Possible

$\$200/\text{MGD} \Rightarrow \$2\text{M}$

Pipeline  $5\text{M} \times \$1.2\text{M} \approx \$6\text{M}$

$\$8\text{ Million total} + \text{ROW}$

- existing lines not reliable

Timing

- 6-7 months on pump order
- switching
- Not by next summer

KWA end of June 30, 2016 connection  
available water

### Electrical Requirements for the Electrical Service at the City of Flint Water Treatment Plant

In accordance with the Ten State Standards, The State of Michigan requires that water plants be supplied with two sources of power to assure a backup power source is in place in the event of an outage to the primary source.

The City of Flint Water Treatment Plant Service Entrance Substation switchgear is currently served by two separate dedicated services from Consumers Energy.

For distinction, the service that enters the Plant from the North shall be referenced as the North Service and the service that enters the Plant from the South shall be referred as the South Service.

Using the Utility maps and a physical drive-by survey of the South Service route, the South Service originates from the N. Dort Hwy and E. Stanley Road Transmission and Distribution Center. The North Service also originates from the N. Dort Hwy and E. Stanley Road Transmission and Distribution center. Within the N. Dort Hwy and E. Stanley Road Transmission and Distribution Center, each one of these services comes from a different buss and substation transformer. Additionally, each service has one back up service as well as the means to be interconnected. This means that each service has two alternate sources of power should there be a failure. (Please see attached sketch.)

Each service is routed independently (on separate dedicated poles) to the site. The North Service is routed to the Buick City Distribution Center and then to the Plant from the North. The South Service is routed from the east to the Plant. The only current connection point for the two services at the Water Plant is at the Plant's Service Entrance Substation transformer yard at the primary of the transformer buss. We plan to remove this interconnect in our work.

We have discussed our approach with Consumers Energy. Consumers Energy presently considers both services as dedicated to the Water Plant. Consumers Energy cannot guarantee that both services will always be dedicated in the future. If Consumers Energy were to consider allowing other customers to share either of the services, they would give adequate notice to the City of Flint (12-18 months) to allow the City to make additional plans for a secondary power source. Based on this understanding, LAN would recommend considering the two services as two dedicated utility feeds to the Plant. This scheme would allow the design to only provide the provisions for a future generator and not actually purchase the generator under this present project. All of the provisions for the installation of the generator, to the new plant switchgear would be included in the design, such as additional main and tie breakers. The actual purchase of the generator would not occur until Consumers Energy allows other customers to share a service.

*Lease in emergency  
↳ plan to place*



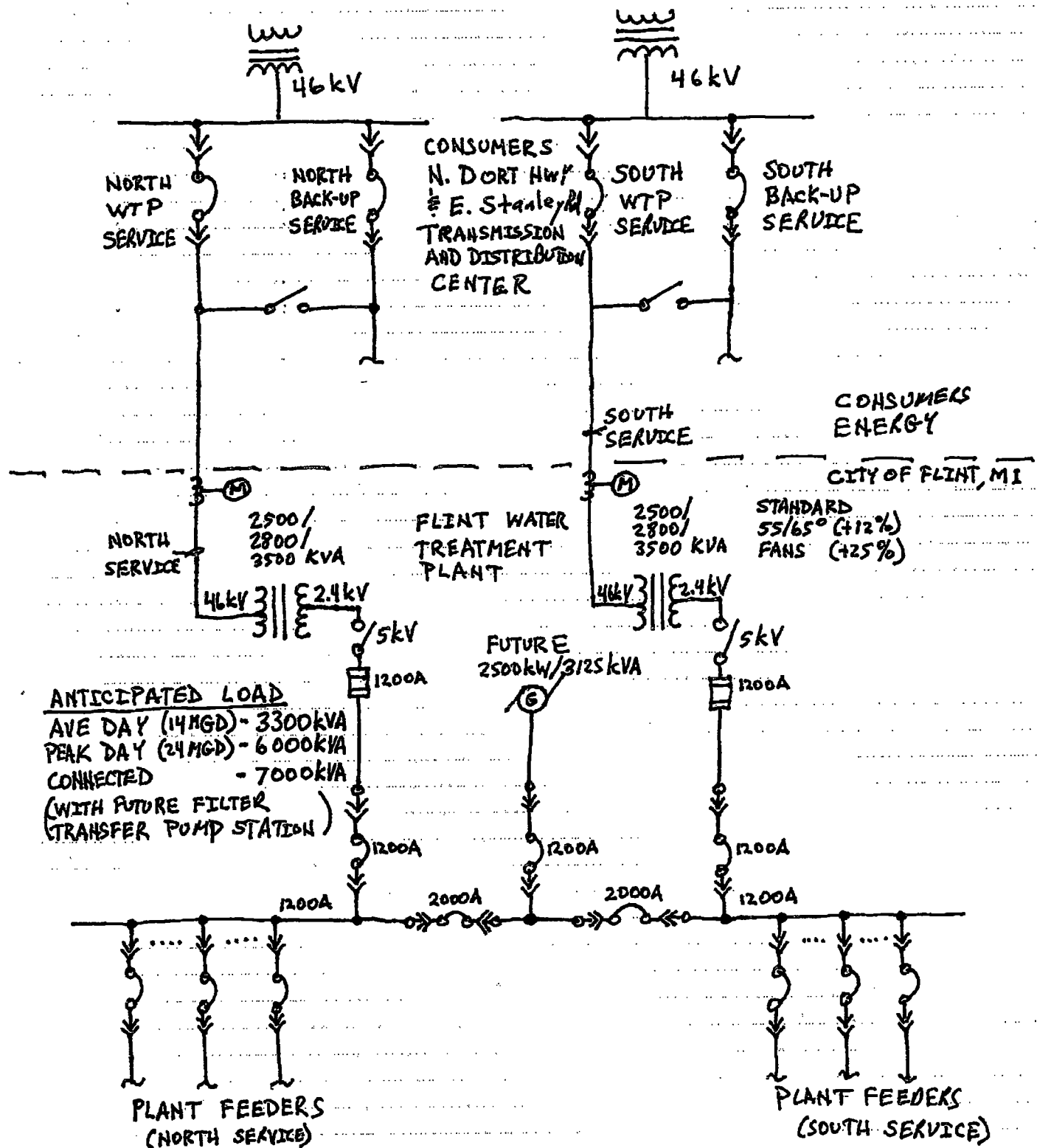
Lockwood, Andrews  
& Newnam, Inc.

A LEO A DALY COMPANY

## DESIGN NOTES AND COMPUTATIONS

SUBJECT: **FLINT WATER TREATMENT  
ELECTRICAL SERVICE IMPROVEMENTS**

SHEET NO. 1 OF 1



PREPARED BY

Denney Howard

DATE

11/4/2013

CHECKED BY

Don Richards

DATE

11/4/2013

PROJECT NUMBER

130-10701-000

D-005

**How do you feel about the state and federal testing protocols now that you know there was a problem?**

We're going to be taking a look at that, and that's why Susan Hedman is here today. What we're seeing is concerning. But in the meantime, we're going to...

Why are you requiring optimization now?

What will you do if the schools you are testing come back with lead?

Is the Governor going to give the city the \$30 million it asked for? Or the \$13 million state Sen. Ananich wants to include in the budget?

Why did the state ignore city residents who have been saying there's a problem for six months?

Why did the Governor hide the fact that he was involved in distributing filters previously?

Will you meet with Marc Edwards?

Do you trust the city's data?

Why did the state allow the city to switch away from DWSD initially?

Has the city put residents at risk?

What will the state do about my children? Lead poisoning causes irreversible damage.

Is lead just a problem in Flint?

Why isn't the Governor here today?

Does the Flint River have lead? Is it more corrosive than the water from DWSD?

If the lead is in individual homes' plumbing, how long will it take to fix this problem? Will the move to KWA fix it, or will we still see lead?

Will testing start over when we move to KWA?

Why aren't Kildee and Ananich here?

How much are we paying all these new consultants – Dr. Wells and the EPA expert?

**City of Flint Water - Funding Solution  
State of Michigan Commitment**

| Agency                              | GF/GP              | Gross               | Comments                                                                                                                      |
|-------------------------------------|--------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Filters:</b>                     |                    |                     |                                                                                                                               |
| Health & Human Services             | \$1,016,000        | \$1,016,000         | AY15 work project                                                                                                             |
| Health & Human Services             | \$0                | \$1,000,000         | DEQ State Restricted Settlement Funds provided to HHS Emergency Services local office (FY16 appropriation).                   |
| <b>Subtotal Filters:</b>            | <b>\$1,016,000</b> | <b>\$2,016,000</b>  |                                                                                                                               |
| <b>Reconnect to DSW:</b>            |                    |                     |                                                                                                                               |
| Environmental Quality               | \$5,000,000        | \$6,000,000         | Reconnection costs ~\$1.3m/month x 9 mos. to be shared by state & Flint                                                       |
| <b>Subtotal Reconnect:</b>          | <b>\$5,000,000</b> | <b>\$6,000,000</b>  | DEQ State Restricted Settlement Fund of \$1m; balance GF/GP                                                                   |
| <b>Testing Costs:</b>               |                    |                     |                                                                                                                               |
| Environmental Quality               | \$1,000,000        | \$1,000,000         | Additional tests at state lab; cost per sample: \$26                                                                          |
| <b>Subtotal Testing:</b>            | <b>\$1,000,000</b> | <b>\$1,000,000</b>  |                                                                                                                               |
| <b>Additional Agency Support:</b>   |                    |                     |                                                                                                                               |
| LARA                                | \$0                | \$200,000           | Support for plumbing inspectors to do schools (public and parochial) and health facilities (hospitals, Long Term Care, etc.). |
| MSHDA                               | \$0                | \$249,300           |                                                                                                                               |
| Health & Human Services             | \$600,000          | \$600,000           | Follow-up on children with elevated blood levels                                                                              |
| Environmental Quality               | \$300,000          | \$300,000           | Home and school inspections.                                                                                                  |
| <b>Subtotal Additional Support:</b> | <b>\$900,000</b>   | <b>\$1,349,300</b>  |                                                                                                                               |
| <b>ALL TOTAL</b>                    | <b>\$7,916,000</b> | <b>\$10,365,900</b> |                                                                                                                               |

## City of Flint Boil Water Advisory Event Timeline

August 12<sup>th</sup> -- Routine distribution sampling yielded 3 samples

| Sample Site | Address           | Free Chlorine | Total Chlorine |
|-------------|-------------------|---------------|----------------|
| # 4         | 3606 Corunna Rd.  | 0.1           | 0.2            |
| # 5         | 2501 Flushing Rd. | 0.1           | 0.1            |
| C.S.        | 1100 Cedar St.    | 0.0           | 0.1            |

August 13<sup>th</sup> -- Distribution repeat sampling along with upstream and downstream locations yielded 8 samples positive for coliform bacteria (all but C.S. Downstream); with one sample positive for E. coli (# 4 Downstream).

| Sample Site     | Address            | Free Chlorine | Total Chlorine |
|-----------------|--------------------|---------------|----------------|
| # 4             | 3606 Corunna Rd.   | 0.0           | 0.1            |
| # 4 Upstream    | 3521 Corunna Rd.   | 0.0           | 0.1            |
| # 4 Downstream  | 3614 Corunna Rd.   | 0.0           | 0.1            |
| # 5             | 2501 Flushing Rd.  | 0.0           | 0.1            |
| # 5 Upstream    | N. Chevrolet       | 0.0           | 0.1            |
| # 5 Downstream  | 2740 Flushing Rd.  | 0.0           | 0.1            |
| C.S.            | 1100 Cedar St.     | 0.0           | 0.1            |
| C.S. Upstream   | 1035 Ann Arbor St. | 0.0           | 0.0            |
| C.S. Downstream | 702 W. 12th St.    | 0.7           | 1.1            |

August 14<sup>th</sup> -- Notified DEQ of test results from August 13<sup>th</sup> sampling. Resampled all 9 locations. Sampling yielded one sample positive for coliform bacteria at Site # 5.

| Sample Site     | Address            | Free Chlorine | Total Chlorine |
|-----------------|--------------------|---------------|----------------|
| # 4             | 3606 Corunna Rd.   | 0.2           | 0.4            |
| # 4 Upstream    | 3521 Corunna Rd.   | 0.4           | 0.7            |
| # 4 Downstream  | 3614 Corunna Rd.   | 0.4           | 0.7            |
| # 5             | 2501 Flushing Rd.  | 0.0           | 0.1            |
| # 5 Upstream    | N. Chevrolet       | 0.0           | 0.1            |
| # 5 Downstream  | 2740 Flushing Rd.  | 0.1           | 0.3            |
| C.S.            | 1100 Cedar St.     | 0.6           | 0.9            |
| C.S. Upstream   | 1035 Ann Arbor St. | 0.0           | 0.1            |
| C.S. Downstream | 702 W. 12th St.    | 0.0           | 0.1            |

August 15<sup>th</sup> -- Resampled Site # 5 along with upstream & downstream locations. Site # 5 and upstream locations were positive for coliform bacteria. DEQ requires boil water notice to be issued tonight.

| Sample Site    | Address           | Free Chlorine | Total Chlorine |
|----------------|-------------------|---------------|----------------|
| # 5            | 2501 Flushing Rd. | 0.3           | 0.5            |
| # 5 Upstream   | 1117 N. Chevrolet | 0.0           | 0.1            |
| # 5 Downstream | 2740 Flushing Rd. | 0.1           | 0.3            |



August 16<sup>th</sup> – Sampled 5 sites in boil water notice area, and Site # 5 along with upstream & downstream locations. 1 site (Burger King) in the boil water area tested positive for total coliform bacteria. Site # 5 upstream location was also [REDACTED]

| Sample Site           | Address             | Free Chlorine | Total Chlorine |
|-----------------------|---------------------|---------------|----------------|
| # 4                   | 3606 Corunna Rd.    | 0.2           | 0.4            |
| # 4 Upstream          | 3521 Corunna Rd.    | 0.3           | 0.5            |
| YaYa's (DS)           | 3709 Corunna Rd.    | 0.2           | 0.3            |
| Sandi's Catering (UP) | 1001 Ballenger Hwy. | 0.1           | 0.2            |
| Burger King (UP)      | 1006 Ballenger Hwy. | 0.1           | 0.3            |
| # 5                   | 2501 Flushing Rd.   | 0.1           | 0.2            |
| # 5 Upstream          | 1117 N. Chevrolet   | 0.1           | 0.2            |
| # 5 Downstream        | Ballenger Hwy.      | 0.2           | 0.4            |

August 17<sup>th</sup> – Sampled six sites in the boil water notice area 24 hours after the first set. Also sampled Site # 5 upstream location. The Burger King sample was positive for total coliforms.

| Sample Site           | Address             | Free Chlorine | Total Chlorine |
|-----------------------|---------------------|---------------|----------------|
| # 4                   | 3606 Corunna Rd.    | 0.2           | 0.4            |
| # 4 Upstream          | 3521 Corunna Rd.    | 0.3           | 0.6            |
| YaYa's (DS)           | 3709 Corunna Rd.    | 0.1           | 0.3            |
| Sandi's Catering (UP) | 1001 Ballenger Hwy. | 0.1           | 0.3            |
| Burger King (UP)      | 1006 Ballenger Hwy. | 0.1           | 0.3            |
| Hungry Howie's (DS)   | 3625 Corunna Rd.    | 0.1           | 0.4            |
| # 5 Upstream          | 1117 N. Chevrolet   | 0.1           | 0.3            |

August 18<sup>th</sup> – Sampled 7 sites in the boil water notice area. Samples were also collected at site # 5 along with upstream and downstream locations.

| Sample Site         | Address             | Free Chlorine | Total Chlorine |
|---------------------|---------------------|---------------|----------------|
| # 4                 | 3606 Corunna Rd.    | 0.2           | 0.4            |
| # 4 Upstream        | 3521 Corunna Rd.    | 0.3           | 0.5            |
| # 4 Downstream      | 3614 Corunna Rd.    | 0.2           | 0.3            |
| YaYa's (DS)         | 3709 Corunna Rd.    | 0.1           | 0.3            |
| Abbotts Meat (UP)   | 3623 Blackington    | 0.1           | 0.2            |
| Burger King (UP)    | 1006 Ballenger Hwy. | 0.1           | 0.2            |
| Hungry Howie's (DS) | 3625 Corunna Rd.    | 0.1           | 0.3            |
| # 5                 | 2501 Flushing Rd.   | 0.3           | 0.5            |
| # 5 Upstream        | 1117 N. Chevrolet   | 0.1           | 0.2            |
| # 5 Downstream      | 1274 Ballenger Hwy. | 0.2           | 0.5            |

First seven results available @ 3:20pm, the rest @ 5:20pm



GENESEE COUNTY DRAIN COMMISSIONER'S OFFICE

- DIVISION OF -

WATER & WASTE SERVICES

G-4610 BEECHER ROAD - FLINT, MICHIGAN 48532-2617  
PHONE (810) 732-7870 - FAX (810) 732-9773

JEFFREY WRIGHT  
COMMISSIONER

December 23, 2014

Sue McCormick, Director  
Detroit Water and Sewerage Department  
735 Randolph Street  
Detroit, MI 48226

Re: Term Agreement  
Genesee County Drain Commissioner, County Agency

Dear Director McCormick:

We have received and reviewed your letter dated December 12, 2014. As stated in your letter, DWSD and GCDC have been working towards a mutually agreeable solution to a situation that is very unique. In essence, GCDC and DWSD are negotiating toward a short-term, full service contract and a long-term emergency service contract. DWSD currently does not have any contract like this, so there have been many details to work out during our negotiations. There remain two (2) issues that need to be resolved: the cost versus the benefit of the emergency service and the fixed fees that need to be paid during the full service period. During our last conversation with representatives of your office, the later issue may be resolved. With that said, GCDC has committed to negotiating with DWSD to try and reach a mutually acceptable contract for short-term, full service and long-term emergency water supply.

I think it is beneficial to review the time line of events that have transpired.

December 20, 1965

The City of Flint and City of DWSD signed a 35 year contract, which expired on December 31, 2000. The contract continued on a year to year basis thereafter with a one year termination notice provision.

A key item in this contract was that DWSD gave franchise rights to the City of Flint for all of Genesee County. As a result, Genesee County could not be a direct customer of DWSD.

April 12, 2013

After the announcement that Flint signed as a constituent member of the KWA, DWSD sent the City of Flint a notice of termination of the contract to be effective April 2014.

November 2013

DWSD/GCDC/DEQ/State met TO DISCUSS Flint's decision process for deciding to go to KWA or stay with DWSD. Also discussed transition if separation was to occur.

April 17, 2014

Contract terminated by DWSD, City of Flint still purchased water, GCDC still purchased water, and Detroit modified its rate to a non-contract customer rate.

Orig: Liane Sholte  
Smith  
DDWMA

cc: Director  
S496  
McDermott  
Crew  
4-1 MISC

Datema  
Wurfe

Liane  
Steve B.

|                   |                                                                                                                                                                            |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| April 30, 2014    | City of Flint stopped receiving water from DWSD. GCDC closed two valves isolating Flint from the system. Closing the valves was witnessed by personnel of DWSD.            |
| May 1, 2014       | GCDC acquired the meter pit then FL-1 now GN-01 from Flint and GCDC became a direct non-contract customer of DWSD.                                                         |
| May and June 2014 | GCDC paid its portion of the Flint rate 2013/2014 rate plus a penalty for non-contract status.                                                                             |
| July 1, 2014      | DWSD and GCDC determined the usage patterns for GCDC.                                                                                                                      |
| August 8, 2014    | DWSD established a contract rate and a non-contract rate based on GCDC flows and ownership of the meter pit. DWSD billed the new non-contract rate effective July 1, 2014. |
| November 2014     | Negotiations reach an impasse. DWSD says it's going to add additional penalty to GCDC rates.                                                                               |
| December 2014     | DWSD sends notice that DWSD is going to recommend an additional \$1,287,600 to GCDC rates because GCDC is unique.                                                          |

We have enclosed our rate structure for the past year and the calculation of that rate. Our "current rates" as described in the December 12 letter already includes a penalty and now DWSD in mid-year wants to add an additional penalty.

Back in November of 2013, we all met in Detroit with the Governor regarding water rates and Flint's evaluation of DWSD versus KWA. At that meeting, you spoke of stranded costs and your obligation to recover those costs. Flint signed a 35 year contract. Flint remained a customer for 49 years until DWSD terminated its contract with Flint. There are no stranded costs remaining and if there are, those stranded costs rightfully belong with Flint, who was the contract holder with DWSD. Flint has fulfilled its contractual obligations and upon fulfilling those obligations, DWSD has never identified any stranded costs. Therefore, stranded costs are not at issue in our negotiations and they should not be included in the rate model applied to GCDC.

Since you terminated the contract with Flint, the volume of water has been reduced by 12-18 mgd to the Flint/GCDC area. What new capital investment can you point to that was for the benefit of GCDC? Please provide the legal argument that GCDC might be responsible for these costs. Keep in mind that GCDC has never signed an agreement with DWSD committing it to capital costs for any DWSD projects. GCDC has always made it clear that we would like full service from DWSD through 2016. After that, we were desirous of a mutual aid/backup supply agreement.

The State of Michigan requires a true cost of service in rate making for utilities serving greater than 1% of the State's population. DWSD falls into this category. For your 2013-2014 Budget, you set the rates for all customers by terminating Flint and charging an additional penalty – you received a windfall of revenue from the penalty. For your 2014-2015 Budget, you did not include Flint or GCDC in your rate calculation. The water revenue and penalty paid by GCDC is a windfall. Now mid-year, you are requesting an additional surcharge for the balance of the year – another windfall.

As you stated, we are unique. This uniqueness was identified in August of 2014 when you established a rate for GCDC outside of your rate model. In comparison to your contract customers, GCDC is unique. Contract customers are calculated by the model, even though GCDC rates are calculated by the model, GCDC pays a non-contract penalty as a percentage. This penalty is not paid by contract customers. Additionally, GCDC pays 80% of its rates in fixed fees. Contract customers pay 40% of its rates in fixed fees. Finally, it appears GCDC's rates can be changed arbitrarily at the whim of the Director and Board. Contract customers cannot.

This new proposed rate is vindictive, insulting and illegal. Both Genesee County and the City of Detroit are subdivisions of the State of Michigan. Should these punitive rates be put into effect, we will aggressively pursue all remedies available. With respect to the Governor, we have honored his request to not sue DWSD, but that is a request he can no longer expect us to honor.

Your statement that GCDC is in a fundamentally different position from Flint and other customers of DWSD as GCDC is correct, as GCDC has never been a contractual customer of DWSD. It is important here to recognize that due to the actions of DWSD in giving the franchise rights to the City of Flint for all of Genesee County, it was not possible for GCDC to be a customer. DWSD's actions are the only reason GCDC has never been a contract customer of DWSD. Flint was the only "old contract" customer that had their contract terminated. Why?

If it is the intent of DWSD to recapture capital costs associated with DWSD infrastructure investments, DWSD should have pursued these claims against the City of Flint when DWSD terminated its relationship with Flint. In essence, your argument is that any new customer to your system should be required to pay for prior improvements to the DWSD system even though the improvements were for a different customer of DWSD, the fact remains that the GCDC/Flint area uses 40% less water volume today than 8 months ago when Flint was also purchasing water from DWSD. DWSD has not needed to upgrade its infrastructure, nor has GCDC requested DWSD to do so, to furnish less water to the Genesee County area. Therefore, to establish another new rate for a non-contract customer to recoup capital investment that was never committed to that customer demonstrates clearly that this is a play to force GCDC into a long-term agreement with DWSD or results in a punitive charge.

GCDC and DWSD have been negotiating a short-term/long-term contract. GCDC does not need a backup supply from DWSD. We are willing to consider one if the cost is beneficial to our system. DWSD is the one that is requiring a thirty year agreement not GCDC. When GCDC separates from DWSD, there is significant infrastructure that will be mothballed or abandoned by

Sue McCormick  
December 23, 2014  
Page 4

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DWSD. GCDC has offered to purchase the infrastructure from DWSD. This sale would be beneficial to both systems. These negotiations have been put in jeopardy by your threat to increase our rates unless we meet your demands for a long-term agreement.

Due to the above, GCDC has no choice but to suspend negotiations until this issue is resolved.

On a final note, it is interesting that you sent this letter the day after the Emergency Manager resigned.

Sincerely,



John F. O'Brien, P.E., Director  
Division of Water and Waste Services

CC: Governor Snyder  
Dan Wyant, Director, DEQ  
Mayor Mike Duggan  
Jeff Wright, GCDC  
Laurie Koester, Esq.  
Kevin Kilby, Esq.

## **DEPARTMENT OF ENVIRONMENTAL QUALITY**

### **GOVERNOR'S OFFICE BRIEFING PAPER CITY OF FLINT DRINKING WATER**

#### **What contributed to the Boil Water Advisories in the city of Flint?**

A number of factors, not one specific cause, likely contributed to the Boil Water Advisories (BWAs) in the city of Flint during August and September 2014. While use of the Flint River has increased the amount of natural organic matter in the city's water, the Flint Water Treatment Plant (WTP) has performed well above treatment requirements for organic carbon removal. In addition, less than 20 percent of the water system was included in the advisory area. If treatment had been compromised, detections would have been widespread throughout the city, rather than in such a localized area.

The city's water distribution system has suffered from a lack of infrastructure investment and asset management. Most of the city's over 550 miles of water mains are now over 75 years old and constructed of cast iron piping. Cast iron pipe is subject to internal corrosion, called tuberculation, which causes buildup on the pipe interior, leading to water quality issues, reduced flow and pressures, and leakage. Tuberculation also encourages the development of biofilms, layers of bacteria that attach to the interior pipe wall. Biofilm growth is common in areas of piping with little or no disinfectant residual, and together with tuberculation can clog water lines to the point of insufficient water pressure.

The city has also experienced decades of a declining user base and water use associated with vacant homes, commercial businesses, and industrial property. Declining water use leads to excess residence time within the city's distribution pipes and water storage facilities, accelerating tuberculation, biofilm growth, and disinfectant residual degradation. While the city has recently seen an infusion of funding for blight removal, contractors completing this work have been improperly using fire hydrants, causing hydraulic disturbances that dislodged and suspended settled debris, which may have contributed to the bacterial contamination.

The winter of 2014 was also one of the coldest experienced by the water system. The city, which historically has unaccounted water losses of over 30 percent, has seen even greater losses since February 2014 due to an increase in cold weather-related water main breaks and leaks. The city lacks a formal maintenance program for its over 7,250 valves, which would normally be used to limit impacts during break repairs. Two valves on the transmission line used to supply the area of the BWAs were found to be closed during the city's investigation, causing longer residence time, reduced disinfectant residual, reduced flow, and reduced pressure. One of these valves has remained broken.

IV/5 EM Substitutes  
IV/13 EM Reschedule

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Adm  
IV/21 TC Mch  
IV/22

The BWAs also occurred during the warmest and, for 2014, relatively wet periods of August and September. Warm weather conditions are not only more conducive to bacterial growth but also degrade the water's disinfectant residual carried out from the WTP more quickly. Longer residence times, biofilms, and tuberculation also contribute to disinfectant residual degradation. Warm wet weather conditions also allow water contaminated with bacteria to pool around piping with leaks and breaks.

### **Process for Issuance and Cancelation of a Boil Water Advisory**

There are a number of conditions that can trigger BWAs. This includes the following:

- Bacteria Monitoring Detections
- Bacteria Standards Violations
- Treatment System Failures
- Waterborne Disease Outbreaks
- Loss of System Pressure
- Water Main Breaks
- Other Interruptions in Service

The Department of Environmental Quality (DEQ) has developed a policy and procedure regarding BWAs to help guide staff, provide consistency, and maintain public health. A PDF of Policy and Procedure No. ODWMA-399-022 is being forwarded with this briefing paper.

BWAs may be self-initiated by the water system, issued collaboratively in consultation with the DEQ, or when necessary mandated by the DEQ. Requesting customers to boil the water when bacterial contamination has occurred provides an added barrier of public health protection.

The BWAs that recently occurred in the city of Flint were associated with bacteria monitoring detections and violations of bacteria standards. These advisories were issued by the city of Flint collaboratively in consultation with the DEQ.

Current regulations regarding monitoring and standards for bacteria in water distribution systems were developed by the U.S. Environmental Protection Agency, have been in effect since 1990, and were incorporated into the Michigan Safe Drinking Water Act, 1976 PA 399, as amended. There are a variety of bacteria, parasites, and viruses that can potentially cause health problems if humans ingest them in drinking water. Testing water for each of these potential pathogens would be difficult and expensive. Instead, water systems test for total coliform and *E.coli*. Total coliform bacteria react to water treatment in a manner similar to many pathogens. Therefore, the presence of total coliform in drinking water indicates there may be a pathway for pathogens or other contaminants to enter the system. The absence of total coliforms in the distribution system minimizes the likelihood that pathogens are present. *E.coli* is itself a pathogen, and its detection would be direct evidence of a health risk.



Once a BWA has been issued, time is needed to investigate potential causes and implement corrective measures. The larger the water system, the more time this may take. Once corrective measures have been taken, samples must be collected and analyzed to confirm that bacteria are no longer present. Using the most common analytical method, samples must be incubated for a period of 24 hours before results can be obtained. In situations where the bacterial contamination has been confirmed, two consecutive rounds of safe samples collected at least 24 hours apart are normally obtained before canceling a BWA. Adding each of these steps together, a normal response period to cancel a BWA under these circumstances would be expected to take at least 3 to 4 days.

### **Recent History of the City of Flint Water System**

Historically, the city of Flint had been a customer of the Detroit Water and Sewerage Department (DWSD) while simultaneously maintaining the Flint WTP to provide emergency backup service using the Flint River. The WTP performed quarterly test operations to maintain readiness and was utilized twice in 2009, supplying water once for 2 days and the other for 3 days.

In April 2013 the city of Flint notified the DWSD that it would be terminating service in the future and contracting for raw water service from the Karegnondi Water Authority (KWA). Work on the KWA pipeline from Lake Huron broke ground in June 2013 and is expected to be completed with connection in late 2016.

In August 2013 Rowe Professional Services Company completed an engineering proposal for improvements to the Flint WTP that would allow continuous operation of the WTP utilizing the Flint River in lieu of continuing service from the DWSD until completion of the KWA pipeline. In March 2014 the city of Flint entered into a Consent Agreement with the DEQ regarding the Flint WTP's lime sludge facility. In April 2014 the DEQ issued a construction permit for improvements to the Flint WTP. On April 25, 2014, the city of Flint began continuous operation of the WTP, using water from the Flint River and discontinued the purchase of water from the DWSD.

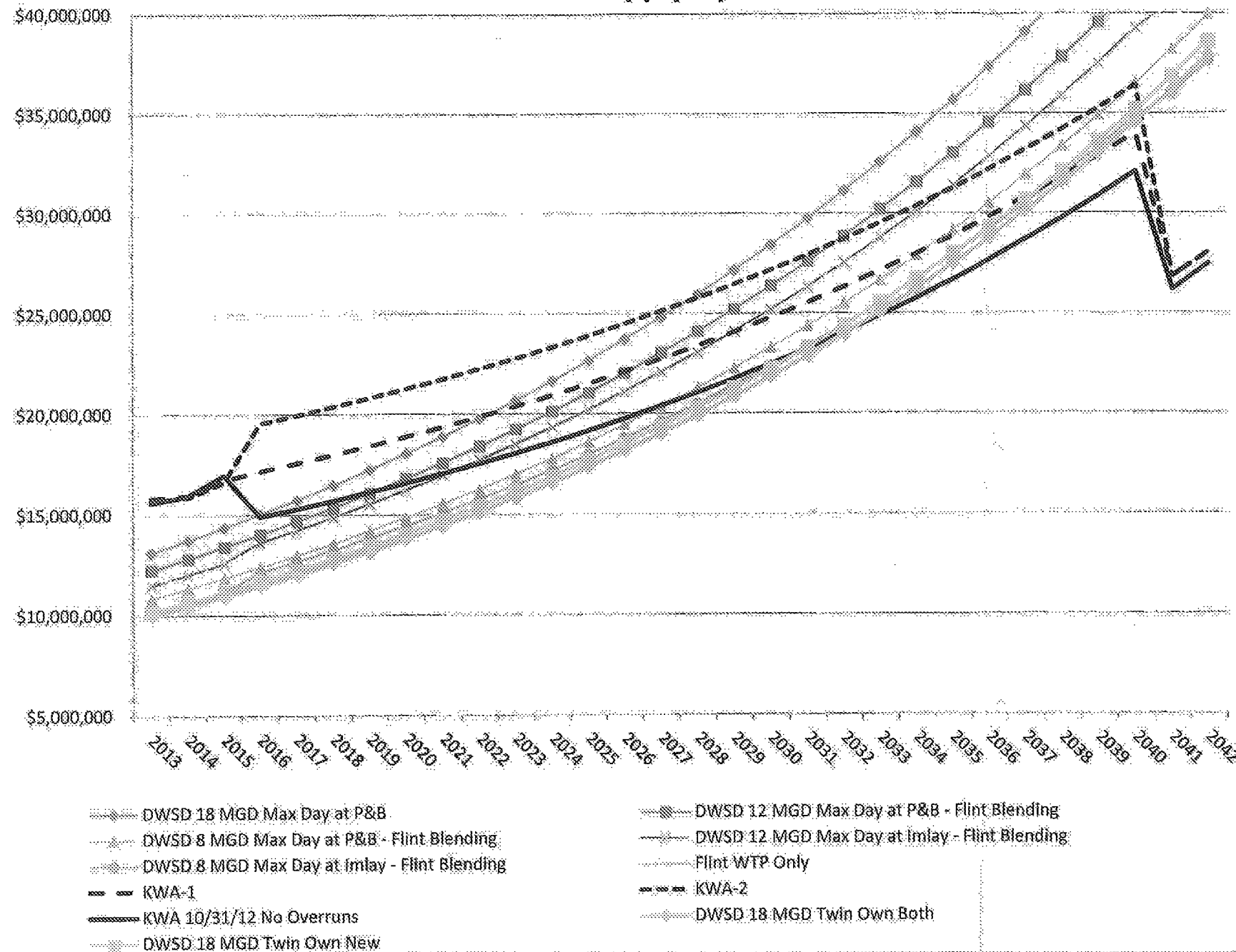
A BWA was issued for August 15-20, 2014, for a portion of the city of Flint due to localized detections of total coliform and *E.coli* bacteria. Another BWA was issued for September 5-9, 2014, due to localized detections of total coliform bacteria in the same and adjacent portions of the city of Flint. The advisory covered an area of approximately six square miles. The city of Flint has a total land area of just over 34 square miles.

Governor's Office Briefing Paper  
City of Flint Drinking Water  
Page 4

While many of the BWA contributing factors listed above require long-term solutions, the city has taken operational steps to limit the potential for a BWA to reoccur. The city has increased flushing of water mains to limit residence time, maintain disinfectant residual, and help remove buildup and deposits within the piping. The city is boosting chlorine disinfectant residual at locations in the distribution system as needed. The city continues to investigate water leaks and water main breaks and the status and condition of system valves.

Prepared by: Stephen Busch, P.E.  
Lansing and Jackson District Supervisor  
Office of Drinking Water and Municipal Assistance  
Department of Environmental Quality  
October 1, 2014

## Flint Water Supply Options



| Option                        | Costs through 2042 | Ranking |
|-------------------------------|--------------------|---------|
| Flint WTP Only                | \$ 590,441,893     | 1       |
| DWSD 8 MGD Max Day at Imlay   | \$ 634,795,488     | 2       |
| KWA 10/31/12 Update           | \$ 649,775,166     | 3       |
| DWSD 8 MGD Max Day at P&B     | \$ 672,671,705     | 4       |
| KWA-1                         | \$ 707,279,715     | 5       |
| DWSD 12 MGD Max Day at Imlay  | \$ 725,576,803     | 6       |
| DWSD 12 MGD Max Day at P&B    | \$ 762,110,308     | 7       |
| KWA-2                         | \$ 766,784,313     | 8       |
| DWSD 18 MGD Max Day at P&B    | \$ 821,226,268     | 9       |
| DWSD 18 MGD Max Twin Own Both | \$ 631,244,349     |         |
| DWSD 18 MGD Max Own New Line  | \$ 643,070,941     |         |

# DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning Only New Line to the Flint WTP

## Capacity

Flint ADD: 0.00 MGD - MCF/Day  
 DWSD ADD: 18 MGD 1,604 MCF/Day

## Annual Volume

Flint: - MCF  
 DWSD: 585,561 MCF

## 2013 Cost of Supply

Flint WTP O&M: - /MCF \$ - /Yr  
 DWSD: 17.40 /MCF \$ 10,188,770 /Yr

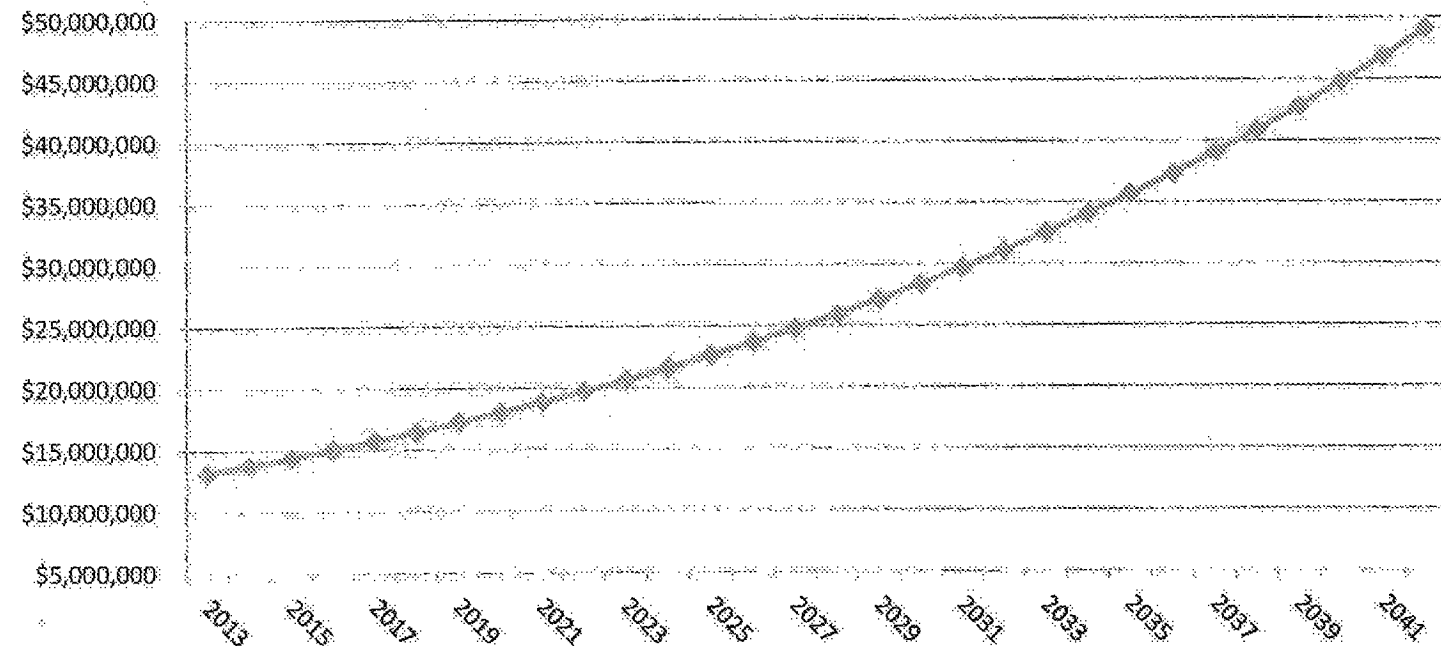
## Escalation/Inflation Rate

Flint: 4.51% /Yr  
 DWSD: 4.7% /Yr

## Capital Expenditure

Amount: \$ -  
 Reserve: \$ - 0% Reserve Rate: 0.00%  
 Amount plus Reserve: \$ -  
 Revenue Bond Rate: 5%  
 Number of Years: 25  
 Annual Cost: \$0

DWSD 18 MGD Maximum Day Customer Twinning Option DWSD Owns New Line



|    | Year | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|----|------|---------------|----------------|----------------------|---------------------|---------------|
| 1  | 2013 | \$ -          | 10,188,770     | -                    | -                   | \$ 10,188,770 |
| 2  | 2014 | \$ -          | 10,667,642     | -                    | -                   | \$ 10,667,642 |
| 3  | 2015 | \$ -          | 11,169,021     | -                    | -                   | \$ 11,169,021 |
| 4  | 2016 | \$ -          | 11,693,965     | -                    | -                   | \$ 11,693,965 |
| 5  | 2017 | \$ -          | 12,243,582     | -                    | -                   | \$ 12,243,582 |
| 6  | 2018 | \$ -          | 12,819,030     | -                    | -                   | \$ 12,819,030 |
| 7  | 2019 | \$ -          | 13,421,525     | -                    | -                   | \$ 13,421,525 |
| 8  | 2020 | \$ -          | 14,052,336     | -                    | -                   | \$ 14,052,336 |
| 9  | 2021 | \$ -          | 14,712,796     | -                    | -                   | \$ 14,712,796 |
| 10 | 2022 | \$ -          | 15,404,297     | -                    | -                   | \$ 15,404,297 |
| 11 | 2023 | \$ -          | 16,128,299     | -                    | -                   | \$ 16,128,299 |
| 12 | 2024 | \$ -          | 16,886,330     | -                    | -                   | \$ 16,886,330 |
| 13 | 2025 | \$ -          | 17,679,987     | -                    | -                   | \$ 17,679,987 |
| 14 | 2026 | \$ -          | 18,510,946     | -                    | -                   | \$ 18,510,946 |
| 15 | 2027 | \$ -          | 19,380,961     | -                    | -                   | \$ 19,380,961 |
| 16 | 2028 | \$ -          | 20,291,866     | -                    | -                   | \$ 20,291,866 |
| 17 | 2029 | \$ -          | 21,245,584     | -                    | -                   | \$ 21,245,584 |
| 18 | 2030 | \$ -          | 22,244,126     | -                    | -                   | \$ 22,244,126 |
| 19 | 2031 | \$ -          | 23,289,600     | -                    | -                   | \$ 23,289,600 |
| 20 | 2032 | \$ -          | 24,384,211     | -                    | -                   | \$ 24,384,211 |
| 21 | 2033 | \$ -          | 25,530,269     | -                    | -                   | \$ 25,530,269 |
| 22 | 2034 | \$ -          | 26,730,192     | -                    | -                   | \$ 26,730,192 |
| 23 | 2035 | \$ -          | 27,986,511     | -                    | -                   | \$ 27,986,511 |
| 24 | 2036 | \$ -          | 29,301,877     | -                    | -                   | \$ 29,301,877 |
| 25 | 2037 | \$ -          | 30,679,065     | -                    | -                   | \$ 30,679,065 |
|    | 2038 | \$ -          | 32,120,981     | -                    | -                   | \$ 32,120,981 |
|    | 2039 | \$ -          | 33,630,667     | -                    | -                   | \$ 33,630,667 |
|    | 2040 | \$ -          | 35,211,309     | -                    | -                   | \$ 35,211,309 |
|    | 2041 | \$ -          | 36,866,240     | -                    | -                   | \$ 36,866,240 |
|    | 2042 | \$ -          | 38,598,953     | -                    | -                   | \$ 38,598,953 |

25 Yrs Cumulative  
 \$ 466,642,790

30 Yrs Cumulative  
 \$ 643,070,941

# DWSD Worksheet : 18 MGD Maximum Day Customer with Model Contract Twinning Line and Owning both to the Flint WTP

## Capacity

Flint ADD: 8.99 MGD - MCF/Day  
 DWSD ADD: 1.01 MGD 1,604 MCF/Day

## Annual Volume

Flint: - MCF  
 DWSD: 585,561 MCF

## 2013 Cost of Supply

Flint WTP O&M: - /MCF \$ - /Yr  
 DWSD: \$ 17.08 /MCF \$ 10,001,390 /Yr

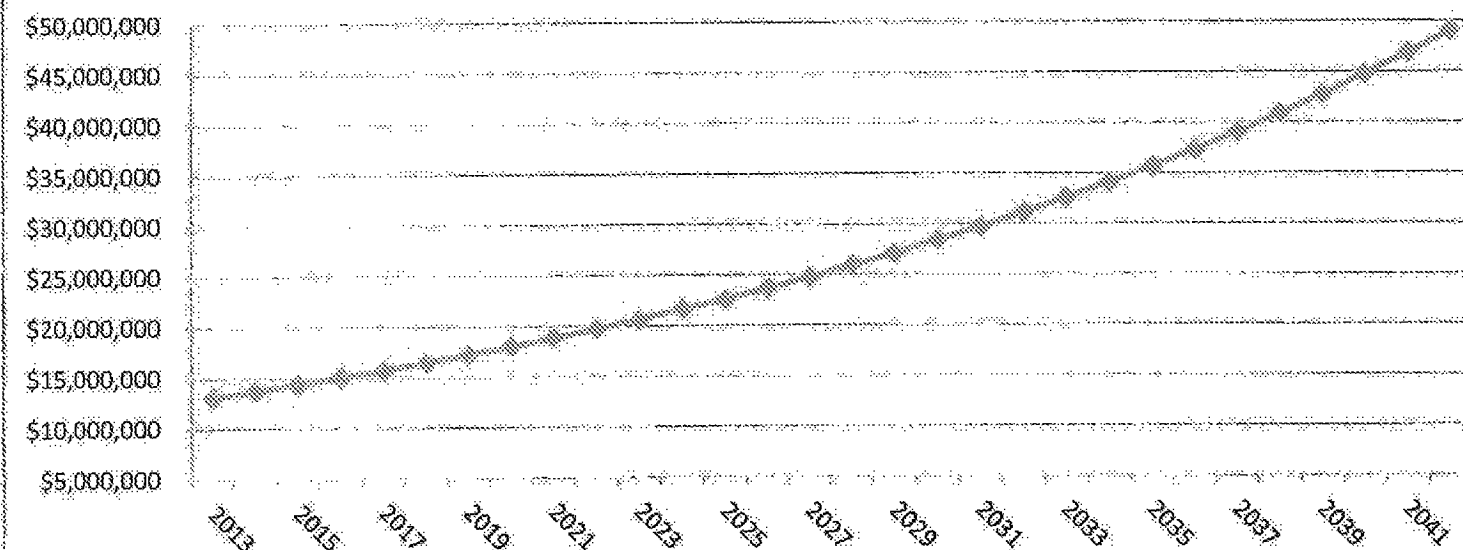
## Escalation/Inflation Rate

Flint: 4.51% /Yr  
 DWSD: 4.7% /Yr

## Capital Expenditure

Amount: \$ -  
 Reserve: \$ - Reserve Rate: 0.00%  
 Amount plus Reserve: \$ -  
 Revenue Bond Rate: 5%  
 Number of Years: 25  
 Annual Cost: \$0

## DWSD 18 MGD Maximum Day Customer Twinning Option DWSD Owns Both Lines



| Year    | Flint WTP O&M | Water Purchase | Revenue Bond Payment | Interest on Reserve | TOTAL         |
|---------|---------------|----------------|----------------------|---------------------|---------------|
| 1 2013  | \$ -          | 10,001,390     | -                    | -                   | \$ 10,001,390 |
| 2 2014  | \$ -          | 10,471,456     | -                    | -                   | \$ 10,471,456 |
| 3 2015  | \$ -          | 10,963,614     | -                    | -                   | \$ 10,963,614 |
| 4 2016  | \$ -          | 11,478,904     | -                    | -                   | \$ 11,478,904 |
| 5 2017  | \$ -          | 12,018,412     | -                    | -                   | \$ 12,018,412 |
| 6 2018  | \$ -          | 12,583,278     | -                    | -                   | \$ 12,583,278 |
| 7 2019  | \$ -          | 13,174,692     | -                    | -                   | \$ 13,174,692 |
| 8 2020  | \$ -          | 13,793,902     | -                    | -                   | \$ 13,793,902 |
| 9 2021  | \$ -          | 14,442,216     | -                    | -                   | \$ 14,442,216 |
| 10 2022 | \$ -          | 15,121,000     | -                    | -                   | \$ 15,121,000 |
| 11 2023 | \$ -          | 15,831,687     | -                    | -                   | \$ 15,831,687 |
| 12 2024 | \$ -          | 16,575,776     | -                    | -                   | \$ 16,575,776 |
| 13 2025 | \$ -          | 17,354,838     | -                    | -                   | \$ 17,354,838 |
| 14 2026 | \$ -          | 18,170,515     | -                    | -                   | \$ 18,170,515 |
| 15 2027 | \$ -          | 19,024,529     | -                    | -                   | \$ 19,024,529 |
| 16 2028 | \$ -          | 19,918,682     | -                    | -                   | \$ 19,918,682 |
| 17 2029 | \$ -          | 20,854,860     | -                    | -                   | \$ 20,854,860 |
| 18 2030 | \$ -          | 21,835,039     | -                    | -                   | \$ 21,835,039 |
| 19 2031 | \$ -          | 22,861,286     | -                    | -                   | \$ 22,861,286 |
| 20 2032 | \$ -          | 23,935,766     | -                    | -                   | \$ 23,935,766 |
| 21 2033 | \$ -          | 25,060,747     | -                    | -                   | \$ 25,060,747 |
| 22 2034 | \$ -          | 26,238,602     | -                    | -                   | \$ 26,238,602 |
| 23 2035 | \$ -          | 27,471,816     | -                    | -                   | \$ 27,471,816 |
| 24 2036 | \$ -          | 28,762,992     | -                    | -                   | \$ 28,762,992 |
| 25 2037 | \$ -          | 30,114,852     | -                    | -                   | \$ 30,114,852 |
| 2038    | \$ -          | 31,530,250     | -                    | -                   | \$ 31,530,250 |
| 2039    | \$ -          | 33,012,172     | -                    | -                   | \$ 33,012,172 |
| 2040    | \$ -          | 34,563,744     | -                    | -                   | \$ 34,563,744 |
| 2041    | \$ -          | 36,188,240     | -                    | -                   | \$ 36,188,240 |
| 2042    | \$ -          | 37,889,088     | -                    | -                   | \$ 37,889,088 |

## 25 Yrs Cumulative

\$ 458,060,853

## 30 Yrs Cumulative

\$ 631,244,349

Kurtz

Flint w/ KWA

Met w/ JED

- JWSID Pipeline Shutdown
- Flint WTP Perm.
- Rate Spike

5/14 GCX 9:00?

517-927-7188

810 766-7346

26-7418

766-810

## Mtg w/ Flint EM

- Warren Green
- EM David Early
- Howard Craft, M.D.
- Joyce Walby
- Betty Johnson
- Susan
- Brent Wright
- Rob Bizwick Dist OC
- Bob Casey, Pollution Control
- Mike Glasco, questions about Communication by City
- Unintended consequences

Warren Green

Howard's Position w/ Customers / Education

- Localized
- Transmission Value
- Lake Huron DT vs. River + WTP DT

Reliability Study July 2013

Recover Budget

↳ Replacement prior to EM's vs. Plan

Back to SSP - Site Candidate

- Training



## *Drinking Water Regulations for Monitoring of Lead in Schools and Child Care Centers*

There is no federal or Michigan law requiring sampling of drinking water in schools that receive water from other public water systems, although schools that have their own water supply are subject to regulation and sampling as non-community public water systems. Schools served by a public water system may be included as a sampling site (i.e., tap) for a public water system's lead and copper monitoring program if there are insufficient single-family homes that qualify. There are no federal requirements for more extensive testing.

The 1986 Amendments to the Safe Drinking Water Act (SDWA) required EPA to develop regulations to control for lead in drinking water. The Lead and Copper Rule (LCR), issued in 1991, is focused on controlling corrosion within the distribution system that delivers water to customers. The 1986 SDWA Amendments also required that only lead-free materials be used in new plumbing and in plumbing repairs.

In 1988, the SDWA was further amended by the Lead Contamination Control Act (LCCA), to reduce the exposure of lead to children in schools and child care facilities. The LCCA prohibited the sale of any drinking water cooler that is not lead-free and required that:

- the EPA identify each brand and model of drinking water cooler, indicating which are lead free and which have a lead-lined tank and distribute the list to states (SDWA Sec. 1463),
- the Consumer Product Safety Commission order that manufacturers and importers of all drinking water coolers identified as having a lead-lined tank repair, replace, or recall and provide a refund for such coolers (SDWA Sec. 1462),
- the EPA publish a guidance document and testing protocol to assist states in determining the source and degree of lead contamination in school drinking water (SDWA Sec. 1464), and
- states establish programs to assist schools and child care facilities to test for and remedy lead contamination problems, with public availability of results of such testing (SDWA Sec. 1464(d)).

As a result of a 1996 court decision, States are not required to establish testing programs. In its decision, the Fifth Circuit held that provisions in section 1464(d) were unconstitutional under the Tenth Amendment to the U.S. Constitution because they directly compelled the state to enact and enforce a federal regulatory program and provided no options for the State to decline the program. The decision did not, however, restrict states from developing and carrying out their own programs to assist schools.

In 1989 and subsequent years, EPA released guidance and information to inform states and school systems how to test for and reduce the risk of lead exposure in school drinking water. EPA's guidance provides a protocol for testing water in schools and recommends that schools take action at fixtures where the lead concentration exceeds 20 ppb. This concentration differs from the 15 ppb action level that public water systems are required to follow. ***The 20 ppb action level is based on a smaller sample collection volume of 250 milliliters (ml) and is designed to pinpoint specific fountains and outlets that require attention.***

In 1990, Michigan did provide schools and licensed child care centers with information to assist in testing and remediating potential lead contamination of their drinking water as required by the Lead Contamination Control Act of 1988. This information included a sampling protocol and guidance on flushing their system to minimize lead exposure.

In 2004, EPA surveyed states to determine what additional programs may exist to control exposure to lead in drinking water at schools and child care centers. Forty-nine states, Puerto Rico, the District of Columbia and the Navajo Nation responded. Only 16 respondents indicated they have or will conduct special sampling or studies to target lead exposure at schools and child care centers. Michigan has not included any additional sampling programs or studies. However, some local agencies have conducted voluntary programs. For example, the W.K. Kellogg Foundation funded a program implemented by the Calhoun County Health Department that sampled schools in Battle Creek. In Michigan's response to this EPA survey, we included a recommendation for EPA to allow schools to be considered as a primary LCR monitoring site so that more information about lead levels in schools would become available. However, no changes in sampling criteria have occurred to date.



In 2005, a Memorandum of Understanding was signed between the EPA, the Department of Education, the Centers for Disease Control and Prevention (CDC), the American Water Works Association, the Association of Metropolitan Water Agencies, the Association of State Drinking Water Administrators, the National Association of Water Companies and the National Rural Water Association to facilitate actions that reduce children's exposure to lead from drinking water at schools and child care facilities.

Across the country and in Michigan, most schools and child care facilities receive water from other community water systems. However, those schools that have their own source of drinking water are considered non-transient non-community water systems and are subject to the LCR. In Michigan, there are 755 such schools and child care centers that must monitor for lead to demonstrate compliance.

1999-

2000

42001

Wdy

Hester

$0.25 \times 3.785 \times 7.2 = 0.33 \frac{1}{4} \times 7.2'$   
10L

3" galvanized

3.785L/Gallon

$\approx 2.63$  gallons

2" copper

$0.25 \times 3.785 =$

243 gal 43.267

0.1631 gallons/#

16.3'



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



DAN WYANT  
DIRECTOR

September 2, 2015

Mr. Brent Wright, Operations Supervisor  
City Of Flint – Department of Public Works  
Flint Water Plant  
4500 North Dort Highway  
Flint, Michigan 48505

WSSN: 02310

Dear Mr. Wright:

SUBJECT: City of Flint – Water Supply  
Return to Compliance Total Trihalomethanes (TTHM)  
3rd Quarter 2015 Monitoring Period

The Department of Environmental Quality (DEQ), Office of Drinking Water and Municipal Assistance (ODWMA), records show that the City of Flint (City) has returned to compliance with the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399); R 325.10610, *Maximum contaminant levels for disinfection byproducts (MCLs)*, of the 1979 Administrative Code.

In accordance with Administrative Rule 610 (R 325.10610, *MCLs for disinfection byproducts*), the MCL for the disinfection byproduct TTHM is 0.080 milligrams per liter (mg/L). Compliance is determined based on a Locational Running Annual Average (LRAA) at each monitoring location. As listed in the table below, our records show that the LRAA all eight of the City's TTHM compliance sampling sites now comply with this standard based on the last four quarterly monitoring periods, ending August 31, 2015. This return to compliance regarding TTHM's began on September 1, 2015, and will continue as long as the LRAA at each of the City's TTHM compliance sampling sites remain below this standard.

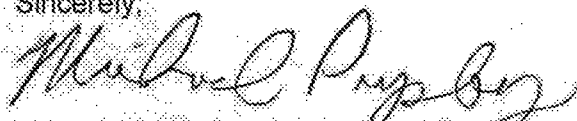
| TTHM Results (mg/L)                             | 11/20/14     | 2/17/15 | 5/18/15 | 8/18/15       | LRAA  | OEL   |
|-------------------------------------------------|--------------|---------|---------|---------------|-------|-------|
| DBP1 McDonalds<br>3719 Davison                  | 0.059        | 0.0162  | 0.0514  | 0.0755        | 0.050 | 0.055 |
| DBP2 Liquor Palace 3302<br>South Dort Highway   | 0.033        | 0.0168  | 0.0635  | 0.0532        | 0.042 | 0.047 |
| DBP3 North Flint Auto<br>6204 North Saginaw St. | 0.041        | 0.0149  | 0.0452  | 0.0426        | 0.036 | 0.036 |
| DBP4 University Market<br>2501 Flushing Road    | <b>0.094</b> | 0.0245  | 0.0598  | 0.0706        | 0.062 | 0.056 |
| DBP5 Taco Bell<br>3606 Corunna Road             | 0.034        | 0.0151  | 0.0547  | 0.0619        | 0.042 | 0.049 |
| DBP6 Rite-Aid Pharmacy<br>5018 Clio Road        | 0.054        | 0.0192  | 0.0605  | 0.0595        | 0.048 | 0.050 |
| DBP7 Salem Housing<br>3216 MLK Boulevard        | 0.050        | 0.0285  | 0.0727  | <b>0.0903</b> | 0.060 | 0.070 |
| DBP8 BP Gas Station<br>822 South Dort Highway   | 0.036        | 0.0199  | 0.0461  | 0.0549        | 0.039 | 0.044 |

Corrective measures by the City have been successful in achieving compliance with this standard. These measures have included replacement of anthracite filter media with granular activated carbon as well as the optimization of water treatment plant and distribution system processes and operations as recommended through Operational Evaluations conducted by the City. It is important that the City continue to follow these recommendations in order to limit disinfection byproduct formation and maintain compliance with the MCL LRAA standards. While the MCL LRAA standard has now been met at all eight compliance sampling sites, an individual TTHM concentration above 0.080 mg/L was measured at one location, DBP 7, during peak month sampling in August 2015.

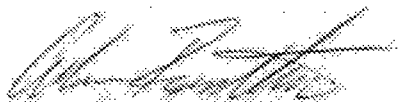
The DEQ encourages the City to continue informing customers about this updated water quality information and compliance with the TTHM MCL standard.

If you have any questions regarding this letter, please contact us at the numbers below, at [prysby@michigan.gov](mailto:prysby@michigan.gov), or [rosenthala@michigan.gov](mailto:rosenthala@michigan.gov).

Sincerely,



Michael F. Prysby, P.E., District Engineer  
Lansing District Office  
Office of Drinking Water and  
Municipal Assistance  
517-290-8817



Adam Rosenthal, Environmental Quality  
Analyst  
Lansing District Office  
Office of Drinking Water and  
Municipal Assistance  
517-284-6644

cc: Ms. Jennifer Crooks, U.S. Environmental Protection Agency, Region 5  
Mr. Robert Bincsik, City of Flint  
Mr. Howard Croft, City of Flint  
Mr. Michael Glasgow, City of Flint  
Genesee County Health Department  
Mr. Stephen Busch, DEQ